

Utilisation of digital educational technologies in Ukraine's educational system



Kateryna Hlianenko^a   | Myroslava Sosnova^a  | Mikola Mikhaylichenko^b  | Mariia Soter^c  |
Yuliia Kuzminska^d 

^aDepartment of Pedagogical and Social Humanitarian Disciplines, Separate Structural Unit "Dnipro Vocational College of Engineering and Pedagogy of the Ukrainian State University of Science and Technology", Kamianske, Ukraine.

^bDepartment of State and Legal Disciplines and Ukrainian Studies, Faculty of Law, Sumy National Agrarian University, Sumy, Ukraine.

^cDepartment of Social and General Technical Disciplines, Pervomaisk Educational and Scientific Institute, Admiral Makarov National University of Shipbuilding, Pervomaisk, Ukraine.

^dInterregional Academy of Personnel Management, Kyiv, Ukraine.

Abstract The modern world is experiencing rapid technological development, and Ukraine is not lagging behind in this process. Therefore, digital education technologies are becoming increasingly relevant in contemporary Ukrainian society due to the swift development of digital technologies and their impact on various aspects of society. Education, which shapes the future of the nation, must adapt to the demands of the modern information society. The importance of studying and implementing new approaches and technologies in the field of digital education is also determined by changes in the job market. Digital education technologies are a factor that prompts the need to instil corresponding digital skills in students, and an instrument that aids in the formation of professionals who meet the needs of the modern labour market. The rapid implementation of digital solutions in the Ukrainian educational environment was primarily driven by quarantine restrictions. However, subsequent states of emergency and the beginning of a full-scale invasion have brought about new changes in the living and working conditions of citizens, particularly educators and education seekers. These events highlight the importance of educational systems being prepared for long-term distance learning and the effective use of digital platforms. This scientific article analyses the implementation of digital tools in the educational process, considering the structural elements of digital competence, the application of web services, and popular online platforms. This research covers various aspects of using digital technologies and emphasizes the impact of digital education on the contemporary education process in Ukraine.

Keywords: digital transformation, digital technologies, digital competences, adaptive learning, innovations, interactive learning platforms

1. Introduction

In the contemporary world, digital education is becoming increasingly important due to the rapid development and implementation of digital technologies in all aspects of life, including education. Information technologies such as the Internet and artificial intelligence are setting new standards for access to knowledge and expanding the possibilities of an innovative approach to learning and teaching.

The active development of information technologies contributes to society's readiness for technological progress. However, it also poses important challenges for contemporary education. Furthermore, changes in the job market specifically determine the importance of skills in working with digital tools and understanding digital processes. Acquiring relevant skills becomes a requirement that defines competitiveness and further employment prospects in the job market. Digital education offers the opportunity to learn and get knowledge anytime and anywhere. It also allows individuals to independently control their educational process through various digital resources and interactive tools. Modern digital technologies introduce innovative opportunities for education, including interactive methods and group and individual learning forms (Kapustnyk et al., 2021; Kharchenko, 2023).

In this context, digital education is significant because it can address the challenges of technological progress, given the active development of information and communication technologies. Additionally, it promotes the development of key skills necessary for successful adaptation in the new digital society.

The aim of this scientific article is to analyse and systematise modern digital technologies in the field of digital education, identify their impact on the educational process, and determine the prospects for their use in the Ukrainian educational environment.



Nikitenko et al. (2022) noted the relevance of education in a digitised society due to the expanding influence of information technology and software on all aspects of the learning process. The study highlights the potential for digital technologies to transform and modernise education. The conclusion suggests an increased need for the use of digital tools in modern education to keep pace with the rapidly changing digitised society.

Sinyaeva et al. (2023) pointed out that the use of information technologies in modern education is an essential part of the learning process. The authors highlight that most students in Ukraine opt for distance learning, underlining the significance of utilising information technologies to guarantee quality education. The analysis of popular platforms and programs such as Moodle, Google Classroom, Zoom, Google Meet, Word Pad, and MathCAD reveals their advantages and limitations, which determine their effectiveness for various types of classes and forms of learning. These software solutions help to organize the learning process and encourage students to study independently.

Shakhina et al. (2022) identified key aspects of digitization that impact the educational environment. They explored how digital transformation aims to ensure continuity and individualization of the learning process through advanced technologies. The work highlights the correlation between digital education and educators' level of digital technology proficiency, which impacts the effectiveness of their use in educational activities. It emphasises the digital education system's mentioned scheme and the significance of managing digital transformation in the educational environment through digital marketing, focusing on various aspects of interaction and innovation stimulation.

2. Materials and Methods

The research process involved several methods. Firstly, a literature review was used to determine the concepts and theoretical aspects of technologies in the field of digital education, as well as their impact on the educational process and the development of the educational environment.

Secondly, statistical data analysis was used to assess the level of digital literacy of students in the modern educational sphere, in order to confirm the growing importance of skills in the use of digital technologies among modern students.

Finally, the systematisation method was used to determine and analyse the structural elements of digital competence that arise as a result of the introduction of educational digital technologies into the education system of Ukraine.

The study employed the method of generalisation to identify widespread technologies of digital education in educational institutions and to analyze the transition to digital innovations in the field of education, as well as its impact on approaches to learning and the content of education.

3. Results

In the current educational context of Ukraine, digital technologies are a crucial tool for transforming the learning process and improving the quality of education. The use of information and communication technologies sets new standards for knowledge accessibility and provides opportunities for innovative teaching methods and fosters the creative development of the educational environment. Therefore, digital education is not only about information processing but also involves a creative process that utilises advanced digital technologies to transform the learning environment. By using digital tools, such as electronic transactions and the Internet, digital education becomes an integral part of the innovation process, facilitating effective communication between professors and students, as well as the exchange of knowledge and ideas (Osadcha, 2018). Digital transformation in education is a strategic approach to progress and development. Educational reformers aim to apply software and IT solutions that improve the quality and enthusiasm of the learning process. Additionally, these solutions facilitate urban living and enhance community-government interaction at an elevated level (Pekhareva & Pekhareva, 2022).

It is important to note that in this context, proficiency in working with digital technologies is progressively becoming a constant and mandatory requirement for most specializations in Ukraine. The number of professions and specialities in Ukraine that require at least a basic understanding of information and communication technologies is rapidly increasing. The uniqueness of possessing digital skills lies in their ability to effectively enhance competencies in various areas of human activity. The development of general and professional digital competencies is crucial for the national education system of Ukraine to keep up with the demands of the digital economy (Andronik, 2021; Byrkovych et al., 2023).

A socio-pedagogical study involving 100 students seeking maritime education at the Danube Institute of the National University "Odessa Maritime Academy" confirms the necessity of digital technology skills. The analysis of control reports revealed that out of 40 second-year students, only 20 were confident users of social media and mobile applications. In terms of proficiency with a desktop computer, only 15 students displayed skills, and merely 5 students were capable of working with an interactive whiteboard. Therefore, the research results confirm that digital competence is a crucial element of success in the modern world. According to Gerganov and Yarmaki (2021), students showed a high level of proficiency in mobile applications, but were less prepared in working with desktop computers and interactive whiteboards.

The digitisation of education presents opportunities to enhance the educational process, increase its speed, and improve the quality of knowledge acquisition. Successful digitisation of education depends on the effective functioning of the economy within the 'digital triangle', which comprises digital citizenship, digital creativity, and digital entrepreneurship

(Tolmach, 2021). In this context, information is a crucial resource for digital education. Digital transformation is reshaping the traditional education system, leading to the development of new qualitative characteristics. This is evident in the increasing number of virtual educational platforms, the ability of small higher education institutions to compete effectively, the repeated use of a single electronic resource to provide various educational services, and the implementation of innovative technologies and digital educational platforms for service delivery (Guralyuk, 2023; Antoshkina et al., 2023).

Furthermore, digital technologies facilitate the virtual mobility of students, allowing them to receive education from universities in other countries and participate in internships beyond their borders. The digital transformation of educational services in Ukraine promotes competition in the European educational arena, ensuring dignity and quality in accordance with European standards (Kraus & Kraus, 2021).

Educational digital technologies offer new opportunities for implementing mobile, differentiated, and personalised learning. It is important to note that these innovative tools do not aim to replace teachers, but rather complement their role. Their essence lies in creating sessions characterised by adaptability, manageability, interactivity, and interaction between individual and group learning, providing unlimited time for material processing (Khvostetskyi & Soya, 2023). Educational technologies automate a significant part of the teacher's work, freeing up human resources for more profound communication, individual work with students, and effective research. They also provide the opportunity for instant feedback, contributing to the improvement of educational and research process management, enhancing overall educational management efficiency. Educational technologies offer new opportunities for professors to engage in interactive learning with their students (Spivachuk & Ikonnikova, 2022; Akimov et al., 2021).

The Ukrainian education system has identified several key competencies resulting from its transformations. These include literacy, language, mathematical and engineering competencies, as well as digital, personal, social, learning, civic, and cultural awareness and self-expression competencies. Digital competence is a crucial component that comprises several structural elements. These elements must be accessible and effectively utilized for the successful implementation of digital education in practice, as presented in Table 1 (Kraus et al., 2018).

Table 1 Building blocks of digital competence.

Digital competences	Competence content
Digital content	Ability to transform, improve and use digital content to create new materials Knowledge of copyright and licensing policies, as well as the ability to write software code
Problem solving	Expertise in solving technical problems related to computer hardware, software and networks Creative use of technology to meet needs and find technical solutions Ability to independently identify the need for new digital skills
Communication and interaction	Ability to communicate effectively using digital technologies Skills to exchange information and interact with society through the use of digital technologies
Information literacy and data management	Ability to find and filter data Skills in evaluating information, data, and managing digital content
Security	Knowledge of security measures and awareness of risks and threats Protection of personal data and privacy Understanding the impact of digital technologies on the environment and health

Source: Kraus et al. (2019)

Significant changes are taking place in Ukrainian education, defining a new direction for the development of the system. Modern universities are becoming the bearers of the educational process and centres of innovation, thereby integrating science and practice. The synergistic approach is apparent in cooperative initiatives, online scientific-educational platforms, and the option to create tailored educational paths (Kremen et al., 2022). Furthermore, the tiered system of thematic modules and the expansion of unconventional education, driven not only by education but also by the growth of competencies and society's inclination towards innovation, have led to the emergence of a new field for development. It is important to note that the success of this new system is determined by the growth of competencies in innovation. The skills and knowledge acquired through interaction with various modules equip society with the readiness to face the challenges of innovative development (Kharchenko, 2023; Shapran et al., 2022).

Online education is currently gaining significant popularity in the learning environment, contributing to the active development of information technologies and communication tools. Web services such as Zoom, Google Classroom, ClassDojo, Kahoot, Tiki-Toki, and Mindomo have proven to be effective, accessible, and user-friendly tools for creating multimedia and interactive content, communication, visualization of educational materials, collaborative work, and learning gamification (Figure 1) (Bower & Torrington, 2020). Furthermore, it is noteworthy that the Moodle educational platform has been highly productive and rapidly spreading in Ukraine. In this context, a multi-vector system for training and developing digital skills has provided pedagogical teams with the necessary tools to utilize this platform. The system comprises professional instructions



for working with the platform and psychological support to overcome potential difficulties and adapt to new conditions (Kapustnyk et al., 2021; Bakhov et al., 2021).

Thus, in Ukraine today, there are a huge number of educational platforms that are used for various purposes, from conducting lessons to creating notes and surveys. Analyzing the most popular among them, it can be noted that during distance learning, 83.2% of teachers preferred the Classroom platform, 73.8% used Meet to communicate with students, and 56.1% of teachers used Zoom to conduct lessons (Yakovleva, 2022; Bielova et al., 2022).

The use of digital technologies in education is currently a stable and significant trend in the development of global and Ukrainian education. Digital textbooks, interactive tools, and remote learning platforms have proven to be effective solutions, especially during times of limited physical presence in classrooms due to quarantine or war (Olefirenko et al., 2022). Additionally, educators use media tools and interactive approaches to introduce innovative teaching methods, such as case studies, research-oriented work, projects, and educational games (Figure 2). These methods create an emotionally comfortable environment for learners, resulting in better assimilation of information and maintaining their desire to learn and create new knowledge and innovations (Hryshchuk, 2021).

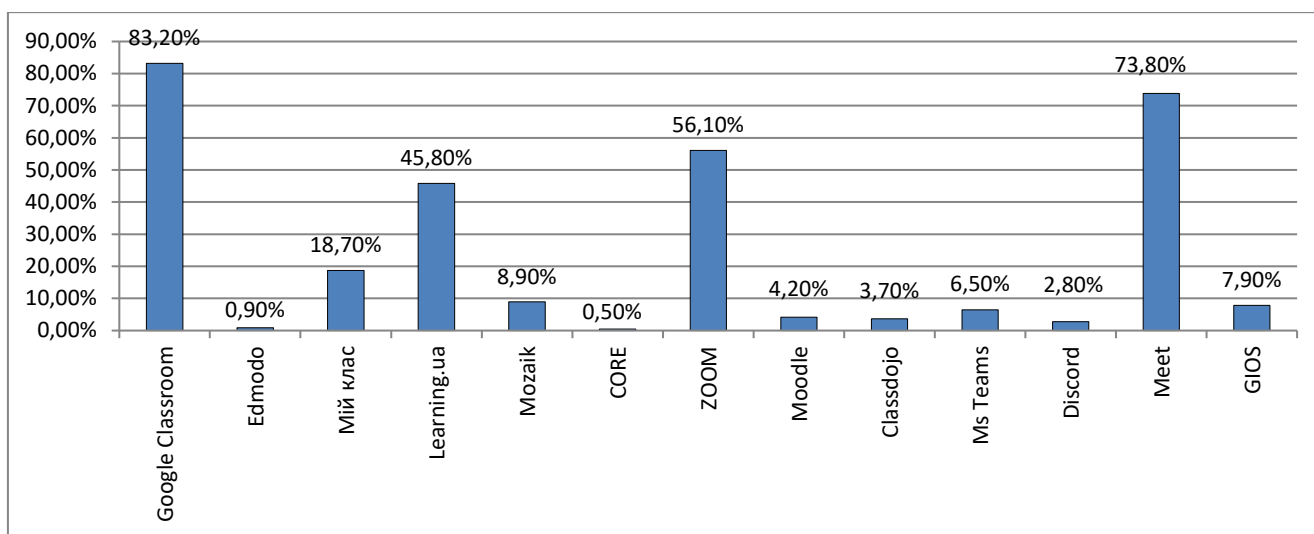


Figure 1 Technologies used during online education.
 Source: Yakovleva (2022)

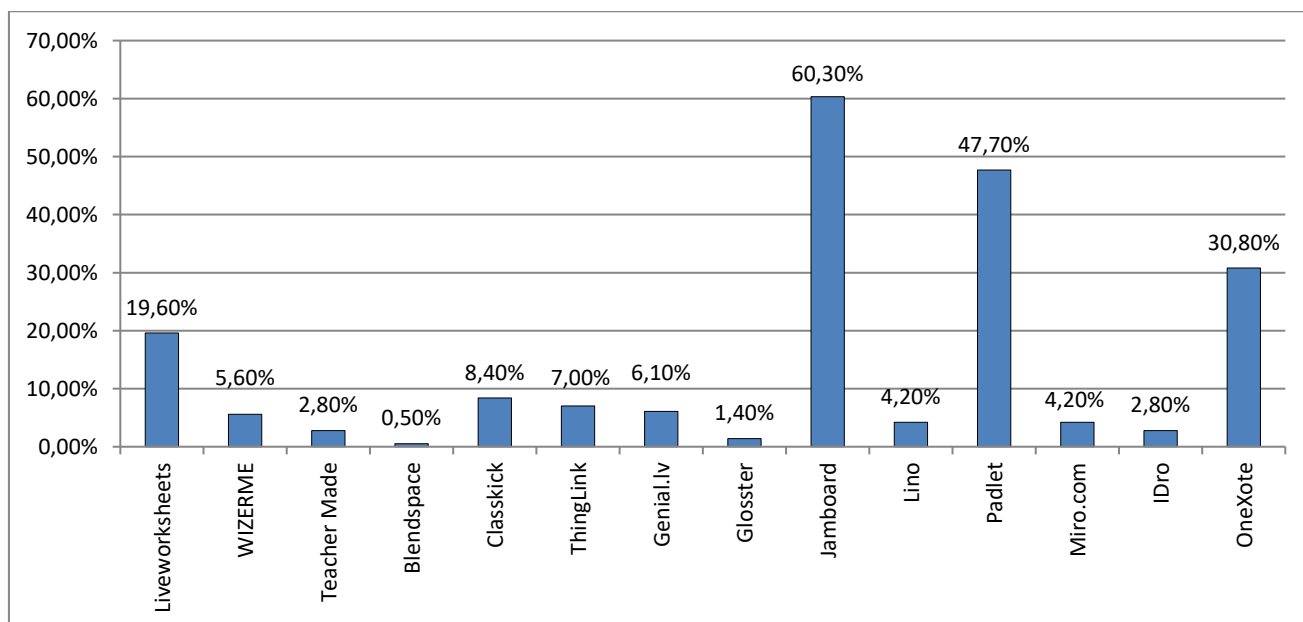


Figure 2 Interactive tools used during online education.
 Source: Yakovleva (2022)

It should be noted that online courses are the most prevalent form of digital technology in the Ukrainian education sector. These courses offer virtual learning programs with a specific curriculum and the possibility of obtaining certificates or degrees. In addition, webinars and similar real-time interactive sessions over the Internet have gained widespread usage. This



approach is an effective tool for learning new skills and developing practical abilities for students. Furthermore, mobile applications are essential in education as they allow students to learn at any time and place. They aid in the acquisition of practical skills such as language, mathematics, and programming (Melnyk, 2023; Klochan et al., 2021; Kolodii et al., 2023).

Acknowledging the transition to digital technologies in the education sector, the Ministry of Education and Science of Ukraine (MESU) considers it necessary to transform approaches to learning and the content of education. This transformation is aimed at shaping citizens capable of making responsible decisions and utilizing innovative approaches to realize human rights in the digital society. Therefore, the implementation of the New Ukrainian School (NUS) is currently crucial for MESU. Its aim is to create a school where learning is an exciting process, and students acquire not only traditional knowledge but also the ability to use it effectively with modern digital technologies (MESU, 2022).

The widespread use of information and digital technologies in the educational process is a defining component of success in implementing the New Ukrainian School. Modern educators must possess skills in creating and using multimedia and interactive content to engage the digital generation of students. This approach is recognised as superior to traditional teaching methods and tools (MESU, 2023).

Ukrainian educators are increasingly turning to cloud technologies in their professional activities due to their accessibility, cost-effectiveness, interactivity, group collaboration, and compatibility with mobile devices. These technologies are the foundation for implementing innovative teaching methods and supporting interaction among all participants in the educational process (Trofymenko, 2021; Yuldashev et al., 2022).

In the modern era, educators can easily and effectively create various situations and interactive tasks for active student engagement through web services. Importantly, learners can access educational materials from any device with high-speed internet connectivity. Various modern technologies are being used to visualize information, including mobile learning, virtual laboratories, gamification, robotics, sketchnoting, and mind maps. These technologies contribute to an effective learning process in the contemporary educational environment (Figure 3) (Liba et al., 2020).

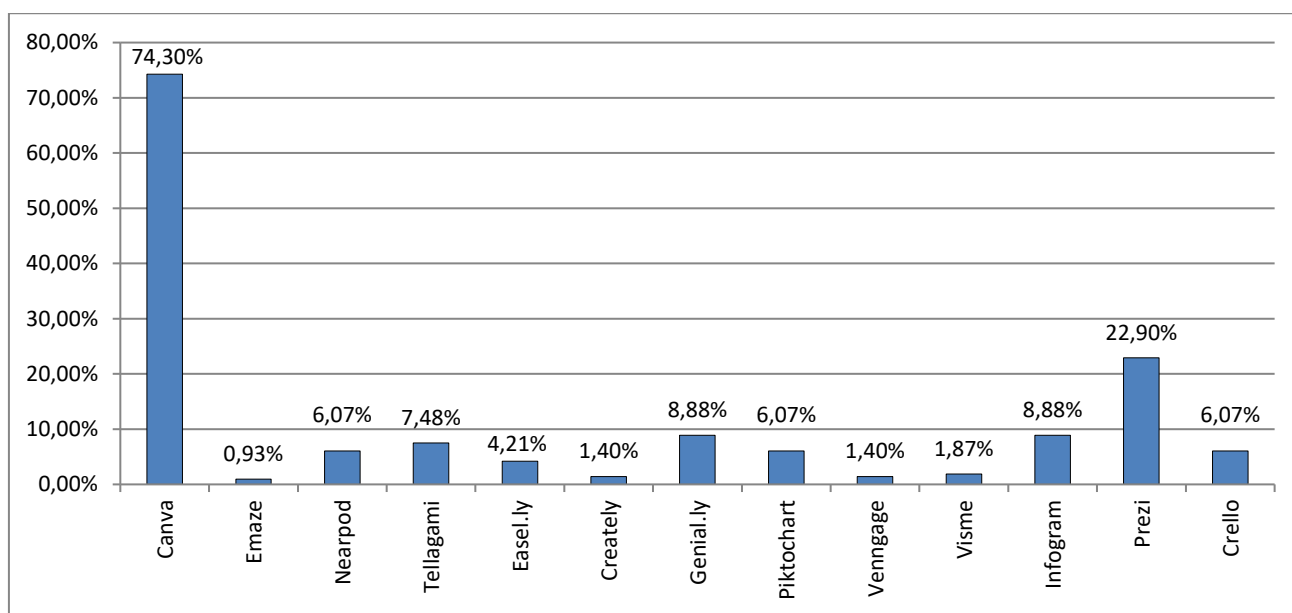


Figure 3 Online tools for data visualization during online education. Source: Yakovleva (2022)

The role of Massive Open Online Courses (MOOC) platforms in providing wide access to online education and enhancing the professional skills of both educators and students is increasing. These platforms allow for the selection of online courses based on the needs of the educational process and contribute to the concept of lifelong learning. MOOC platforms can help overcome geographical limitations, providing opportunities for learning from anywhere in the world. They also allow students and educators to acquire knowledge, interact, and exchange experiences, promoting global integration in the field of education and pedagogy (Beskorsa, 2021; Hubanova et al., 2022).

In Ukraine, MOOC platforms such as Prometheus and EdEra have been successfully implemented in the educational environment. Prometheus is an OpenEdx platform that offers quality educational content from recognized instructors worldwide and Ukrainian educational institutions. It has expanded its scope due to various quarantine restrictions, making it an excellent tool for learning during the COVID-19 pandemic (Petrynska et al., 2021). However, EdEra, another Ukrainian MOOC project developed for educational purposes, introduces innovations into the traditional educational process. The project offers courses in various fields, including school, professional, civic, and corporate education, providing new opportunities for



educational professionals and future teachers. Both projects reflect the trend of active use of MOOC platforms in the modern educational landscape of Ukraine (Vchymo, 2023).

In Ukraine, digital education technologies are widely used to enhance the quality and accessibility of learning. Online courses, webinars, and mobile applications are employed to expand opportunities for both students and educators. MOOC platforms, such as Prometheus and EdEra, play a crucial role in providing quality educational content from recognized instructors worldwide.

4. Discussion

We partially agree with Nikitenko et al. (2022) as their research reveals important aspects of the impact of digital technologies on the educational process and highlights key challenges and opportunities for digital education in Ukraine. The study recognizes that digital technologies individualize and transform learning, providing students with new opportunities for learning anytime, anywhere. However, the ever-evolving nature of digital progress and the growing impact of information and computer technologies on modern society necessitate a continuous update of approaches in digital education. Additionally, there is a need for the development of adaptive strategies and programs that consider the new challenges and opportunities arising from the rapid development of digital technologies.

We concur with Sinyaeva et al. (2023) regarding the importance of utilizing information technologies in modern education. This is especially relevant as the majority of students in Ukraine are currently engaged in distance learning, making the use of information technologies an essential component of their education. The article explores several educational platforms and software, including Moodle, Google Classroom, Zoom, Google Meet, WordPad, and MathCAD. The authors highlight that each platform has its own advantages and limitations. Their use in education depends on the specific activities and formats. The analysis of the software solutions discussed shows that they aid in organizing the educational process and empower students to independently manage their learning.

We agree with the opinions of Shakhina et al. (2022) regarding the important aspects of digital transformation in the educational environment. In particular, their work highlights key issues of digital literacy and its impact on the digital competence of educators. The analysis of factors influencing digital transformation and the identification of different levels of proficiency in digital competencies are also valuable contributions to understanding the digital educational paradigm. Moreover, their conclusions regarding digital technologies and their impact on educational institutions are important for further discussions and the formulation of strategies for improving the educational process in the context of a digital society.

5. Conclusions

In the current global technological landscape, Ukraine is actively employing various digital technologies in education, primarily through the implementation of the New Ukrainian School (NUS). The structural elements of digital competence, such as working with web services (e.g. Zoom, Google Classroom, ClassDojo, Kahoot, Tiki-Toki, Mindomo, etc.), using digital versions of textbooks, and interactive teaching methods, expand the possibilities for both students and educators.

Additionally, online courses and mobile applications have become essential tools for remote learning, providing a flexible mode of education. The use of cloud technologies has greatly facilitated data exchange and working with online tools recently. Employing mobile learning, virtual laboratories, gamification, and robotics can enhance student interest and activate their participation in the learning process. Additionally, practices such as sketchnoting and creating mind maps remain effective means of visualizing and summarizing information.

The use of Massive Open Online Course (MOOC) platforms, such as Prometheus and EdEra, is noteworthy as it broadens access to quality education from renowned educators and educational institutions worldwide. These projects create opportunities for teachers to receive pedagogical support and enhance their qualifications, while also allowing students to choose courses based on their interests and needs.

In summary, Ukraine is actively implementing and developing digital technologies in the field of education. These technologies increase access to educational resources and create conditions for individualized learning and the development of necessary skills for modern society. This process is a key component of the strategy for the development of the education sector and the formation of an innovative educational environment.

Ethical considerations

Not applicable.

Conflict of Interest

The authors declare no conflicts of interest.

Funding

This research did not receive any financial support.

References

- Akimov, O., Karpa, M., Parkhomenko-Kutsevil, O., Kupriichuk, V., & Omarov, A. (2021). Entrepreneurship education of the formation of the e-commerce managers professional qualities. *International Journal of Entrepreneurship*, 25(7). <http://ep3.nuwm.edu.ua/id/eprint/20936> Accessed on April 8, 2024.
- Andronik, N. P. (2021). Content and structure of the course "Methodology of distance learning of foreign languages". *Bulletin of the Chernihiv Collegium National University. Series: Pedagogical Sciences*, 13(169), 47-51. https://er.chdtu.edu.ua/bitstream/ChSTU/2801/1/visnik_block_%2313_169_176str_40ekz-1.pdf#page=47. Accessed on April 8, 2024.
- Antoshkina, V. K., Shevchenko, A. Y., Skryl, S. A., Sadovyi, S. M., & Kuznichenko, O. V. (2023). Problems of legal education development in Ukraine. *International Journal of the Legal Profession*. <https://doi.org/10.1080/09695958.2023.2279758>
- Bakhov, I., Opolska, N., Bogus, M., Anishchenko, V., & Biryukova, Y. (2021). Emergency distance education in the conditions of COVID-19 pandemic: Experience of Ukrainian universities. *Education Sciences*, 11(7), 364. <https://doi.org/10.3390/educsci11070364>
- Beskorsa, O. S. (2021). MOOC: Platforms for professional self-development of future elementary school English teachers. *Scientific Bulletin of Uzhhorod University. Series: "Pedagogy. social work"*, 1(48), 33-38. <https://dspace.uzhnu.edu.ua/jspui/handle/lib/36552>. Accessed on April 16, 2024.
- Bielova, A., Koval, S., Zhuravska, N., & Agayev, A. (2022). The Main Vectors of Labor and Education Transformation of Modern Workforce. *Lecture Notes in Civil Engineering*, 181, 579-589. https://doi.org/10.1007/978-3-030-85043-2_55
- Bower, M., & Torrington, J. (2020). Typology of Free Web-based Learning Technologies. *Bower & Torrington*, 14. <https://library.educause.edu/resources/2020/4/typology-of-free-web-based-learning-technologies>. Accessed on April 8, 2024.
- Byrkovych, T., Humenchuk, A., Kobyzcha, N., Akimova, L., Grinberg, L., & Akimov, O. (2023). Economic effectiveness of state policy in reforming higher library and information education in Ukraine. *Economic Affairs (New Delhi)*, 68(1), 599-616. <https://doi.org/10.46852/0424-2513.1.2023.28>
- Gerganov, L. D., & Yarmaki, A. H. (2021). Introduction of digital technologies in the educational process of the institution of higher marine education. *Young Scientist*, 11(99), 157-159. <https://doi.org/10.32839/2304-5809/2021-11-99-35>
- Guralyuk, A. G. (2023). Digitization as a condition for the development of the education system. *Bulletin of the Chernihiv Collegium National University. Series: Pedagogical Sciences*, 13(169), 3-8. <https://visnyk.chnpu.edu.ua/index.php/visnyk/article/view/349>. Accessed on April 8, 2024
- Hryshchuk, O. (2021). Computer didactic games as one of the elements of informatization of education. Digital competence of the modern teacher of the new Ukrainian school. *IITZN National Academy of Sciences of Ukraine* (pp. 38-43).
- Hubanova, T., Shchokin, R., Hubanov, O., Antonov, V., Slobodianiuk, P., & Podolyaka, S. (2021). Information technologies in improving crime prevention mechanisms in the border regions of southern Ukraine. *Journal of Information Technology Management*, 13, 75-90. <https://doi.org/10.22059/JITM.2021.80738>
- Kapustnyk, V. A., Leshchyna, I. V., Markovskiy, & Zavhorodnii, I. V. (2021). The experience of introducing digital technologies into the educational process of KhNMU. *Materials of the 4th educational and methodical conference of KhNMU*, 11, 3-8. <https://repo.knmu.edu.ua/handle/123456789/29437> Accessed on April 8, 2024.
- Kharchenko, O.O. (2023). The basic principles of quality assurance in the field of digital education at EHEA. *Bulletin of Science and Education. Series: Philology, culture and art, pedagogy, history and archeology, sociology*, 12, 635-645. [https://doi.org/10.52058/2786-6165-2023-6\(12\)-635-645](https://doi.org/10.52058/2786-6165-2023-6(12)-635-645)
- Khvostetskiy, O. V. & Soya, O. M. (2023). The use of digital technologies of communication and cooperation by participants in the educational process in the conditions of distance learning in institutions of general secondary education. In *Theory and practice of using information technologies in the conditions of digital transformation of education: materials of the All-Ukrainian scientific and practical conference* (pp. 191-194). Publishing House of M. Drahomanov State University. <https://enpui.npu.edu.ua/bitstream/handle/123456789/41423/materialy%20konferentsii.pdf?sequence=1#page=191>. Accessed on April 8, 2024
- Klochan, V., Piliaiev, I., Sydorenko, T., Khomutenko, V., Solomko, A., & Tkachuk A. (2021). Digital platforms as a tool for the transformation of strategic consulting in public administration. *Journal of Information Technology Management*, 13, 42-61. <http://dx.doi.org/10.22059/JITM.2021.80736>
- Kolodij, I., Kit, N., Kotsur, V., Shchokin, R., & Pobocho, T. (2023). Information and analytical system of control, planning, and management of the educational process in educational institutions. *Journal of Curriculum and Teaching*, 12(2), 113-122. <https://doi.org/10.5430/jct.v12n2p113>
- Kraus, N. M., & Kraus, K. M. (2021). Sharing economy: institutional mode, universality and novelization of the development of entrepreneurship on virtual digital platforms. *Efficient Economy*, 4, 11. <https://doi.org/10.32702/2307-2105-2021.4.3>
- Kraus, N. M., Kraus, K. M., & Boldyreva, L. M. (2019). Digital competences in the field of higher education: conception, realization, result. *State and regions. Series: Economy and entrepreneurship*, 1(106), 4-9. <https://elibrary.kubg.edu.ua/id/eprint/27061/>. Accessed on April 8, 2024.
- Kraus, N. M., Kraus, K. M., & Holoborodko, O. P. (2018). Digital economy: Trends and prospects for the avant-garde developmental character. *Effective economy*, 1, 1-7. http://www.economy.nayka.com.ua/pdf/1_2018/8.pdf. Accessed on April 8, 2024.
- Kremen, V. G., Bykov, V. Yu., Lyashenko, O. I., Lytvynova, S. G., Lugovoi, V. I., Malyovaniy, Yu. I., Pinchuk, O. P., & Topuzov, O. M. (2022). Scientific-methodical ensuring the digitalization of education in Ukraine: state, problems, prospects: Scientific report to the general meeting of the National Academy of Sciences of Ukraine "Scientific-methodical support for the digitalization of education in Ukraine: state, problems, prospects". *Bulletin of the National Academy of Pedagogical Sciences of Ukraine*, 4(2), 1-49. <https://doi.org/10.37472/v.naes.2022.4223>
- Liba, O. M., & Kupina, B. Yu. (2020). Modern educational technologies for information visualization by creating intelligence maps. In *Education and formation of competitiveness of specialists in the conditions of European integration: a collection of theses of reports of the 4th International Scientific and Practical Conference* (pp. 202-204). <http://dspace-s.msu.edu.ua:8080/handle/123456789/7614>. Accessed on April 8, 2024.
- Melnyk, A. V. (2023). *Prospects for the use of digital technologies in the higher education system: from online courses to virtual reality*. Zhytomyr State University.
- Ministry of Education and Science of Ukraine. (2022). *New Ukrainian school*. <https://mon.gov.ua/ua/tag/nova-ukrainska-shkola>. Accessed on April 8, 2024.
- Ministry of Education and Science of Ukraine. (2023). *Digital transformation of education and science*. <https://mon.gov.ua/ua/tag/cifrova-transformaciya-osviti-ta-nauki>. Accessed on April 8, 2024.
- Nikitenko, O. V., Oleksenko, R. I., & Kivlyuk, O. P. (2022). Formation of values of digital education and digital man in a digitalized society. *Humanities Studies*, 10(87). <https://doi.org/10.26661/hst-2022-10-87-06>

- Olefrenko, T. O., Matvienko, O. V., Vasyutina, T. M., & Zolotareno, T. O. (2022). *Basics of distance and mixed learning organization in institutions of higher and primary education: educational and methodological manual*. NPU named after M.P. Drahomanova. <http://enpuir.npu.edu.ua/handle/123456789/36798>. Accessed on April 8, 2024.
- Osadcha, L. A. (2018). Psychological features of the implementation and use of digital technologies in educational processes at universities. *International Scientific And Practical Conference "Digital Transformation And Innovations In The Economy, Law, Government Management, Science And Educational Processes"* (pp. 120-124). Kyiv. <https://www.inter-nauka.com/uploads/public/15525930925593.pdf>. Accessed on April 16, 2024.
- Pekhareva, S. V., & Pekhareva, A. S. (2022). Organization of distance learning in preschool education institutions: problems and prospects. *Improving the quality of national education in the context of today's challenges*, 204-206.
- Petrynska, N., Yesieva, K., Sapozhnikova, E. (2021). *Learn with Prometheus. Ukrainer*. <https://www.ukrainer.net/prometheus/>. Accessed on April 8, 2024.
- Shakhina, I. Yu., Podzygun, O. A., Petrova, A. I., & Gordiichuk, G. B. (2022). Digitalization as a prospective direction of the contemporary education system. *Modern Information Technologies and Innovation Methodologies of Education in Professional Training Methodology Theory Experience Problems*, 63, 65-77. <https://doi.org/10.31652/2412-1142-2022-63-65-77>
- Shapran, O., Martyniuk, A., Onyshchenko, N., Shapran, Y., & Smakovskiy, Y. (2022). The Phenomenon of Spiritual Content of National Education: Historical and Pedagogical Aspect. *Journal of Higher Education Theory and Practice*, 22(6), 132-137. <https://doi.org/10.33423/jhetp.v22i6.5235>
- Sinyaeva, O., Krekot, M., Zavorodniy, O., Sychova, T., Sychov, A., & Sinyaeva, O. (2023). Features of the use of information technologies in education. *Education. Innovation. Practice*, 11(7), 98-104. <https://doi.org/10.31110/2616-650X-vol11i7-013>
- Spivachuk, V., & Ikonnikova, M. (2022). Modern information and communication technologies in the educational process of higher education institutions. *Scientific Innovations and Advanced Technologies*, 9(11), 220-232. [https://doi.org/10.52058/2786-5274-2022-9\(11\)-220-232](https://doi.org/10.52058/2786-5274-2022-9(11)-220-232)
- Tolmach, M. (2021). Digital technologies in education: possibilities and trends of application. *Digital platform: information technologies in the sociocultural sphere*, 4(2), 159-171. <https://doi.org/10.31866/2617-796X.4.2.2021.247474>
- Trofymenko, O. H. (2021). Cloud technologies in modern education. Science and social life of Ukraine in the era of global challenges for humanity in the digital era. *Publishing house "Helvetika"*, 1, 576-580. <http://dspace.onua.edu.ua/handle/11300/15162?locale-attribute=uk>. Accessed on April 8, 2024.
- Vchymo (2023). Educational Era. <https://vchymo.com/application/EdEra>. Accessed on April 8, 2024.
- Yakovleva, I. (2022). Use of educational platforms in an educational environment. *Ukrainian Pedagogical Journal*, 3, 137-148. <https://uej.undip.org.ua/index.php/journal/article/view/619>. Accessed on April 8, 2024.
- Yuldashev, O. K., Khomiachenko, S. I., & Yuldashev, S. O. (2022). Organizational and legal model of competency-based education as a means of the transition to innovative economy. *Danube*, 13(2), 107-118. <https://doi.org/10.2478/danb-2022-0007>

