Formation of the Concept of "Digital Education 4.0" in the Post-Pandemic Era

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ABSTRACT

Preparing the next generation of professionals is a shared mission of the whole society, requiring the shaping of the Digital Education 4.0 vision in the post-pandemic era. Training the next generation of professionals is a common mission of the whole society, which requires the formation of the concept of Digital Education 4.0 in the post-pandemic era. Digital Education 4.0 is a concept that reflects the transition of the educational system to a new era based on innovative technologies of the Fourth Industrial Revolution (Industry 4.0). This approach involves the active implementation of artificial intelligence, the Internet of Things, big data, virtual and augmented reality, as well as adaptive educational platforms that personalise the learning process. Digital Education 4.0 aims to create a resilient, inclusive, and flexible educational system capable of addressing diverse student needs and bridging geographical and socio-economic gaps. Furthermore, Digital Education 4.0 prepares students with future-ready skills, fostering digital literacy, critical thinking, and adaptability – essential competencies for a rapidly evolving workforce. In the post-pandemic world, where remote and hybrid learning models have become commonplace, Digital Education 4.0 provides a comprehensive framework to enhance engagement, accessibility, and educational outcomes across all levels of learning. This paper explores the foundational elements of Digital Education 4.0, its core technological components, and its potential to revolutionise education in the coming decades.

Key words: digital education 4.0, the post-pandemic era, principles of the concept

INTRODUCTION

The relevance of this study of the formation of the concept of Digital Education 4.0 in the post-pandemic era is extremely relevant in the post-pandemic reality, as the COVID-19 pandemic has significantly accelerated the digitalisation process in all areas, especially in education. By moving to distance and hybrid learning, educational institutions and students have faced the need to use the latest digital technologies, which has opened up new opportunities for organising the educational process. At the same time, these changes have revealed a number of challenges, including unequal access to technology, insufficient digital infrastructure, and the need to develop digital skills for both students and teachers.

Today, digital education goes beyond the simple transfer of learning to an online environment, gaining a deeper meaning in the context of the Fourth Industrial Revolution. Digital Education 4.0 envisages flexible, personalised learning, integration of artificial intelligence, automation, big data and adaptive technologies that make learning more efficient and accessible, and better prepare young people for the professions of the future. This approach contributes to the development of new skills and competences, such as critical thinking, analytics, digital literacy and adaptability, which are important for the modern labour market.

In the context of globalisation and growing competition between countries, Digital Education 4.0 plays a key role in ensuring the competitiveness of national education systems and in developing a workforce for the digital economy. The relevance of the concept is also supported by the need to integrate international experience, implement best practices and ensure sustainable development of education in the context of constant technological and socio-economic changes (Voronkova, Vasyl'chuk, Nikitenko, et al., 2023).

Research problem. The main problem of the study is the need to develop and implement an effective concept of Digital Education 4.0 that would meet the challenges of the post-pandemic era and provide quality training for future professionals for the digital economy. Despite the active digitalisation of education during the COVID-19 pandemic, a number of unresolved issues remain: unequal access to modern technologies, insufficient digital competence of participants in the educational process, lack of infrastructure and methods adapted to digital learning.

In addition, there are challenges related to the need to adapt educational programmes to the rapidly changing needs of the labour market, where innovative technologies, artificial intelligence and big data are playing an increasingly important role. There is a need for new approaches that allow integrating digital tools into educational processes not only as a means of transmitting information, but also as tools for developing critical thinking, creativity, adaptability and collaboration skills.

Thus, the research problem includes the development of approaches to the formation of an education model that can not only adapt to the conditions of global digitalisation, but also contribute to the development of social, economic and technological aspects of modern society, increasing the effectiveness of learning and the competitiveness of graduates in the labour market (Voronkova, Nikitenko, Oleksenko, Andriukaitiene, et al., 2023).

The object of research is the formation of the concept of Digital Education 4.0 in the post-pandemic era.

The aim of the study is to analyse the theoretical and practical aspects of the formation of the concept of Digital Education 4.0 in the post-pandemic era. The COVID-19 pandemic has radically changed the way education systems work, accelerating the adoption of digital technologies and emphasising the need for sustainable, flexible and inclusive learning models. This shift catalysed the emergence of Digital Education 4.0, a concept aligned with the principles of Industry 4.0 that responds to the changing needs of learners and educators in a globally connected, technology-driven world. Digital Education 4.0 encompasses digital infrastructure, innovative pedagogical approaches, and reimagining the curriculum to equip students with skills for future careers. Universities assume a social responsibility that unites the scientific community, empowers action through consensus and cooperation that grows and develops with society. We are aware that in the post-epidemic era, both knowledge and technology are changing, new generations of professionals will need new qualities, and the academic sphere will face new challenges. The most important thing in transforming the model of training the next generation of professionals is practice. Universities are the base for training professionals and bear a heavy responsibility for preparing students for industrial and university practice. Graduates become an important driving force in promoting social change.

Universities should not only assume responsibility for training and developing professionals, but also take on the responsibility for shaping public knowledge. Competing for and cultivating professionals is how countries around the world are actively shaping the concept of Digital Education 4.0 and what they are paying attention to. Professionals of the new generation will lead and dominate the development of the global world, including the economy, culture, society, etc. International interdisciplinary cooperation is a priority model for the development of the next generation of professionals, allowing students to communicate with the world through diversified teaching methods and facilitating student mobility.

Methodology. The research methodology includes several stages and methods aimed at a comprehensive study and analysis of the components of the Digital Education 4.0 concept. The main methods used in the study are as follows:

A review of existing studies and regulations related to the digital transformation of education was

conducted to determine the current state and needs of the educational sector in the context of innovative technologies. This helped to identify the key concepts and practices that form the basis of Digital Education 4.0.

International experience in the digitalisation of education was compared, including the approaches of the EU, the US, China and South Korea, which are actively implementing Industry 4.0 technologies in education. The comparison allowed us to identify best practices that can be adapted for Ukraine.

To understand the needs and challenges of digital education, a survey of teachers and students was conducted, as well as interviews with educational technology experts. This allowed us to understand how the educational community perceives new digital tools and what aspects require additional support. Studying data collected from digital learning platforms to understand students' behavioural patterns, engagement levels and the effectiveness of various digital tools. This allows us to make personalised recommendations to improve learning processes.

The aim of the study is to identify the main components and principles of the concept of Digital Education 4.0 in the post-pandemic era.

RESEARCH RESULTS

Ukraine is a country that values science, technology and innovation. The mobility of professionals is just one of the opportunities for bilateral growth that allows the next generation of professionals to create more opportunities, which requires a strategy for the development of Digital Education 4.0 in the post-pandemic era. In the new era, when learning has become digital and diversified, higher education is gradually transforming. The digital age allows people to conduct collaborative academic research on a global scale. Universities need to develop professional knowledge and skills of digital education 4.0 that meet the needs of enterprises in the new era. Through internships at enterprises, new specialists can be formed in accordance with new disruptive trends (Nikitenko, Andriukaitene, Voronkova, 2024).

Universities have the opportunity to train professionals who meet the innovative needs of enterprises in the new era. Employment trends are moving towards the crossroads of sectoral, interregional and digital development of specialists (Nikitenko, Oleksenko, & Kivliuk, 2022).

Under the influence of the epidemic, the education sector is deeply aware of the importance of digitalisation and intelligence. Universities must educate specialists who can contribute to the implementation of a sustainable society, develop a strategy for the digital development of society and the introduction of disruptive technologies. As we live in an era of globalisation and digitalisation, it is important to develop a carbon neutrality strategy that encourages interdisciplinary learning. The main concept of the philosophy of digitalisation of education 4.0 should be:

1) strengthening the existing global strategy of higher education and developing the qualities of highly competent specialists for the new digital age;
2) forming the concept of cooperation between representatives of industry, government, academia and the public to deepen the partnership of global education;
3) active formation of the concept of global sustainable development and mechanisms of international mobility and exchange of specialists (Oleksenko, 2007);
4) forming the concept of Digital Education 4.0, which brings together the academic community and the industrial revolution to realise mutual benefits between government and academia to change education with the help of digital technologies and interdisciplinary knowledge to achieve sustainable development of society.

Key features of Digital Education 4.0:

1) The use of artificial intelligence algorithms, which allows to tailor learning materials to the individual needs, pace and level of knowledge of each student.
2) Augmented and virtual reality technologies that create environments where students can practise practical skills in a realistic but safe environment.

3) Digital education that supports lifelong learning, which is especially important in the fast-paced environment of the modern labour market.

4) The use of big data, which allows educational institutions to assess student progress, improve teaching methods and make informed decisions about programme content.

5) Online courses, MOOC platforms and distance learning, which provide access to quality education for people anywhere in the world, reducing inequality in access to knowledge (Oleksenko, K., 2018).

Thus, the concept of Digital Education 4.0 contributes to the creation of a learning system that meets the requirements of the modern economy and trains specialists who can quickly adapt to changes in the technological environment. The main principle of Digital Education 4.0 in Ukraine is declared – investment in the future of learning to return human-centred education. The main competences of Education 4.0 are defined: 1) digital and technological skills; 2) cooperation and self-management; 3) innovation and creativity; global citizenship and civic responsibility. Priority areas and approaches to building Education 4.0 have been identified, in particular, the High Tech approach to learning, aimed at using technology while maintaining personally oriented learning. It is about technology combined with an individual touch. Therefore, the monograph will identify the way to the future of Digital Education 4.0 through personalised learning combined with high technology.

Digitalisation of education has a number of significant advantages that contribute to the competitiveness of the modern economy. Among the main ones are the following (Table 1)

Table 1. Advantages of digitalisation of education for increasing the competitiveness of the modern economy

The main advantages	Content and characteristics of the benefits of digitalisation of education
1. Increasing access to education.	Digital tools and online platforms make learning materials accessible to a wide range of people, regardless of their place of residence or economic status. This contributes to equalising educational opportunities, training more professionals and increasing human capital.
2. Increasing the flexibility of learning	The use of digital resources allows students to study at their own pace and on their own schedule. This flexibility provides a more personalised approach to education and promotes independence, which is an important skill for the modern labour market.
3.Building up-to-date digital skills	The modern economy requires employees with skills in digital tools, big data, artificial intelligence and other innovative technologies. The digitalisation of education makes it possible to integrate these skills into the learning process, increasing the competitiveness of graduates.
4.Stimulating innovation	Digitalisation allows educational institutions to introduce innovative approaches to teaching and research. For example, the use of virtual reality, simulations, and artificial intelligence in teaching promotes deeper learning and expands research opportunities, which stimulates innovative economic development.
5.Improving learning through data analytics	The use of digital systems allows for the collection and analysis of data on student performance, progress and needs. This helps institutions adapt curricula, improve teaching methods and respond quickly to changes in labour market needs.
6.Reducing the cost of education	Digital tools can reduce the cost of organising the educational process, especially through distance learning. This makes education more accessible and training more cost-effective, which contributes to the overall growth of the economy.
7. Reducing the gap between education and the labour market.	Digital technologies allow educational institutions to respond more quickly to the needs of the labour market and change curricula to meet new requirements. For example, online learning platforms can quickly add courses on hot topics such as cybersecurity, blockchain, or data management. This allows graduates to acquire knowledge that is relevant and in demand, thereby increasing their competitiveness.

8.Globalisation of the educational process	Thanks to digital tools, education is becoming global: students can participate in online university programmes from different countries, and professors can lecture to students around the world. This facilitates cultural exchange, sharing of best practices and new ideas, which in turn stimulates innovation and growth of the global economy.
9.Development of lifelong learning	Digitalisation of education facilitates access to lifelong learning, which is especially important in a rapidly changing technological environment. Employees can quickly update their knowledge and skills by taking online courses or trainings, while remaining competitive in the labour market. This allows the economy to maintain a high level of labour force skills.
10.Supporting entrepreneurial activity	Digital education platforms provide opportunities to learn entrepreneurial skills and access resources for start-ups, such as online courses in business, finance, marketing and management. This stimulates the development of small and medium-sized businesses, creating new jobs and increasing the level of entrepreneurship, which in turn has a positive impact on the economy.
11.Interdisciplinary learning and knowledge integration	Digitalisation opens up opportunities for an integrated approach to learning that combines knowledge from different fields. Students can study several disciplines at the same time, thus developing a more comprehensive and flexible mindset necessary to meet the complex challenges of the modern labour market.
12.Reducing barriers to innovative education	Technology provides access to the latest knowledge that was once the privilege of large research centres and universities. This stimulates not only the development of science, but also allows the economy to involve more and more people in innovation processes, which is important for maintaining international competitiveness.

Table 1 (compiled by the author)

Due to these advantages, the digitalisation of education is becoming one of the main factors in increasing the competitiveness of the economy, as it contributes to the creation of a skilled, technologically savvy and adaptive work environment. The digitalisation of education not only expands opportunities for personal learning and development, but also contributes to the formation of a modern, highly skilled workforce, which is a driving force for economic growth and innovation. Thanks to the digitalisation of education, the economy is becoming more flexible, able to quickly adapt to changes, while maintaining a competitive advantage in the global market (Oleksenko, Kryvylova et al., 2021).

Conclusions. The concept of Digital Education 4.0 is becoming an important benchmark for building a modern educational system that can effectively meet the challenges of the post-pandemic world. It envisages a transition to innovative educational models based on the integration of the technologies of the Fourth Industrial Revolution, such as artificial intelligence, the Internet of Things, big data, virtual and augmented reality. These tools not only make education more flexible, accessible and efficient, but also help to develop critical thinking, digital literacy and adaptive skills necessary for a successful career in a rapidly changing technological environment.

The study shows that although successful models of digitalisation in education already exist in different countries, the implementation of Digital Education 4.0 in Ukraine requires adapting these practices to national specifics. It is important to provide sufficient support for infrastructure, conduct training for teachers, and increase the level of digital literacy among students. In addition, it is necessary to continue to improve the regulatory framework to protect the rights and privacy of users of digital education platforms.

The following conclusions can be drawn from the study of the concept of Digital Education 4.0 in the post-pandemic era:

For the successful implementation of the Digital Education 4.0 model in the post-pandemic period, which will ensure the flexibility and efficiency of the educational process in the face of rapid change, it is recommended to take the following measures:

Ensure the availability of modern digital technologies and platforms for all participants in the educational process, including remote regions and socially vulnerable groups.

Invest in network infrastructure (high-speed internet, cloud services) to ensure reliable communication during distance learning.

Introduce flexible, adaptive educational platforms that can be customised for different levels of education and specialities.

Introduce digital literacy programmes for teachers, including the development of modern educational platforms, learning analysis tools and interactive learning programmes.

Provide students and schoolchildren with the opportunity to learn digital safety, ethics and culture skills that will facilitate the safe and effective use of digital technologies.

Create adaptive curricula that can be easily modified in line with labour market requirements and technological innovations.

Integrate active learning methods (gamification, blended learning, project-based learning) that promote student engagement and improve the quality of knowledge acquisition.

Use VR/AR technologies and simulations for hands-on learning, especially in areas that require visual or practical experience.

Introduce a system of personalised educational trajectories that will allow students to choose disciplines that match their professional interests.

Apply artificial intelligence and machine learning to analyse student progress, provide personalised recommendations and support, allowing each student to develop at their own pace.

Implement automated assessment systems to objectively monitor student progress, which will reduce the human factor and improve the transparency of the assessment process.

Use big data analytics to track learning outcomes, identify weaknesses and adjust programmes based on real-world performance.

Support international experience exchange programmes in the field of digital education to adapt the best practices of EU countries and expand opportunities for studying abroad.

Cooperate with international organisations to develop common standards for digital education, which will help unify educational practices and increase the competitiveness of graduates in the global market.

Develop blended learning models that can quickly adapt to changing circumstances (distance or face-to-face learning) without losing the quality of education.

Introduce asynchronous and synchronous learning formats so that students can choose the time and method of learning according to their needs and capabilities.

Create psychological support systems that take into account the impact of digital learning on the emotional state of students and teachers.

Provide regular support to students in the form of stress management, time management, and emotional intelligence training.

These recommendations will contribute to the implementation of an effective Digital Education 4.0 model that will meet the challenges of the modern world and provide a flexible, adaptive, and high-quality educational process.

In general, the Digital Education 4.0 concept has the potential to promote an inclusive, personalised and secure educational environment that meets the needs of modern society. The implementation of this concept will be an important step in the development of future-oriented Ukrainian education and will help create conditions for quality education accessible to every student, regardless of their place of residence or social status.

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Research problem. The main problem of the study is the need to develop and implement an effective concept of Digital Education 4.0 that would meet the challenges of the post-pandemic era and provide quality training for future professionals for the digital economy. Despite the active digitalisation of education during the COVID-19 pandemic, a number of unresolved issues remain: unequal access to modern technologies, insufficient digital competence of participants in the educational process, lack of infrastructure and methods adapted to digital learning.

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Methodology. The research methodology includes several stages and methods aimed at a comprehensive study and analysis of the components of the Digital Education 4.0 concept. The main methods used in the study are as follows:

A review of existing studies and regulations related to the digital transformation of education was conducted to determine the current state and needs of the educational sector in the context of innovative technologies. This helped to identify the key concepts and practices that form the basis of Digital Education 4.0.

International experience in the digitalisation of education was compared, including the approaches of the EU, the US, China and South Korea, which are actively implementing Industry 4.0 technologies in education. The comparison allowed us to identify best practices that can be adapted for Ukraine.

To understand the needs and challenges of digital education, a survey of teachers and students was conducted, as well as interviews with educational technology experts. This allowed us to understand how the educational community perceives new digital tools and what aspects require additional support. Studying data collected from digital learning platforms to understand students' behavioural patterns, engagement levels and the effectiveness of various digital tools. This allows us to make personalised recommendations to improve learning processes. **The aim of the study** is to identify the main components and principles of the concept of Digital Education 4.0 in the post-pandemic era.

Results. The concept of Digital Education 4.0 is becoming an important benchmark for building a modern educational system that can effectively meet the challenges of the post-pandemic world. It envisages a transition to innovative educational models based on the integration of the technologies of the Fourth Industrial Revolution, such as artificial intelligence, the Internet of Things, big data, virtual and augmented reality. These tools not only make education more flexible, accessible and efficient, but also help to develop critical thinking, digital literacy and adaptive skills necessary for a successful career in a rapidly changing technological environment.

The study shows that although successful models of digitalisation in education already exist in different countries, the implementation of Digital Education 4.0 in Ukraine requires adapting these practices to national specifics. It is important to provide sufficient support for infrastructure, conduct training for teachers, and increase the level of digital literacy among students. In addition, it is necessary to continue to improve the regulatory framework to protect the rights and privacy of users of digital education platforms. The recommendations will contribute to the implementation of an effective Digital Education 4.0 model that will meet the challenges of the modern world and provide a flexible, adaptive, and high-quality educational process. In general, the Digital Education 4.0 concept has the potential to promote an inclusive, personalised and secure educational environment that meets the needs of modern society. The implementation of this concept will be an important step in the development of future-oriented Ukrainian education and will help create conditions for quality education accessible to every student, regardless of their place of residence or social status.

Keywords: Digital Education 4.0, the post-pandemic era, principles of the concept

„Skaitmeninio švietimo 4.0" koncepcijos formavimas popandeminėje eroje

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SANTRAUKA

Aktualumas. „Skaitmeninio švietimo 4.0" koncepcijos formavimo aktualumas popandeminėje eroje yra itin aktualus popandeminėje realybėje, nes COVID-19 pandemija gerokai paspartino skaitmeninimo procesą visose srityse, ypač švietimo. Pereidami prie nuotolinio ir hibridinio mokymosi, švietimo įstaigos ir studentai susidūrė su poreikiu naudotis naujausiomis skaitmeninėmis technologijomis, o tai atvėrė naujas galimybes organizuoti ugdymo procesą. Kartu šie pokyčiai atskleidė nemažai iššūkių, įskaitant nevienodas galimybes naudotis technologijomis, nepakankamą skaitmeninę infrastruktūrą ir poreikį ugdyti tiek studentų, tiek mokytojų skaitmeninius įgūdžius. Šiandien skaitmeninis švietimas neapsiriboja paprastu mokymosi perkėlimu į internetinę aplinką ir įgyja gilesnę prasmę Ketvirtosios pramonės revoliucijos kontekste. „Skaitmeninis švietimas 4.0" numato lankstų, individualizuotą mokymąsi, dirbtinio intelekto, automatizavimo, didžiųjų duomenų ir pritaikomųjų technologijų integravimą, kad mokymasis taptų efektyvesnis ir prieinamesnis, jaunimas būtų geriau parengtas ateities profesijoms. Šis požiūris padeda ugdyti šiuolaikinei darbo rinkai svarbius naujus įgūdžius ir kompetencijas, pavyzdžiui, kritinį mąstymą, analizę, skaitmeninį raštingumą ir gebėjimą prisitaikyti.

Atsižvelgiant į globalizaciją ir didėjančią šalių konkurenciją, „Skaitmeninis švietimas 4.0" atlieka svarbų vaidmenį užtikrinant nacionalinių švietimo sistemų konkurencingumą ir ugdant skaitmeninės ekonomikos darbo jėgą. Koncepcijos aktualumą patvirtina ir poreikis integruoti tarptautinę patirtį, įgyvendinti gerąją praktiką ir užtikrinti tvarią švietimo plėtrą nuolatinių technologinių ir socialinių bei ekonominių pokyčių kontekste (Voronkova, Vasylchuk, Nikitenko et al., 2023).

Tyrimo problema. Pagrindinė tyrimo problema – poreikis sukurti ir įgyvendinti veiksmingą „Skaitmeninio švietimo 4.0" koncepciją, kuri atitiktų popandeminės eros iššūkius ir teiktų kokybiškus mokymus būsimiems skaitmeninės ekonomikos specialistams. Nepaisant aktyvaus švietimo skaitmeninimo COVID-19 pandemijos metu, lieka nemažai neišspręstų klausimų: nevienodos galimybės naudotis šiuolaikinėmis technologijomis, nepakankama švietimo proceso dalyvių skaitmeninė kompetencija, skaitmeniniam mokymuisi pritaikytos infrastruktūros ir metodų trūkumas.

Tyrimo objektas yra „Skaitmeninio švietimo 4.0" koncepcijos formavimas popandeminėje eroje. COVID-19 pandemija iš esmės pakeitė švietimo sistemų veikimą, paspartindama skaitmeninių technologijų diegimą ir pabrėždama tvarių, lanksčių ir įtraukių mokymosi modelių poreikį. Šis pokytis paskatino „Skaitmeninio švietimo 4.0" koncepcijos, suderintos su „Pramonės 4.0" principais, kuri atitinka kintančius besimokančiųjų ir pedagogų poreikius globaliai susijusiame, technologijomis pagrįstame pasaulyje, atsiradimą.

Metodika. Tyrimo metodika apima kelis etapus ir metodus, kuriais siekiama išsamiai ištirti ir analizuoti „Skaitmeninio švietimo 4.0" koncepcijos komponentus. Pagrindiniai tyrime naudojami šie metodai.

Siekiant nustatyti dabartinę švietimo sektoriaus būklę ir poreikius inovatyvių technologijų kontekste, buvo atlikta esamų tyrimų ir reglamentų, susijusių su švietimo skaitmenine transformacija, peržiūra. Tai padėjo nustatyti pagrindines sąvokas ir praktiką, kurios sudaro „Skaitmeninio švietimo 4.0" pagrindą.

Buvo palyginta tarptautinė švietimo skaitmeninimo patirtis, įskaitant ES, JAV, Kinijos ir Pietų

Korėjos, kurios aktyviai diegia „Pramonės 4.0“ technologijas švietime, metodus. Palyginimas leido mums nustatyti geriausią praktiką, kurią galima pritaikyti Ukrainai.

Siekiant suprasti skaitmeninio ugdymo poreikius ir iššūkius, buvo atlikta mokytojų ir mokinių apklausa, taip pat interviu su švietimo technologijų ekspertais. Tai leido mums suprasti, kaip švietimo bendruomenė suvokia naujas skaitmenines priemones ir kokiems aspektams reikia papildomos paramos. Studijuojami iš skaitmeninių mokymosi platformų surinkti duomenys, siekiant suprasti mokinių elgesio modelius, įsitraukimo lygį ir įvairių skaitmeninių priemonių efektyvumą. Tai leidžia mums teikti asmenines rekomendacijas, kaip pagerinti mokymosi procesus. Tyrimo tikslas – nustatyti pagrindinius „Skaitmeninio švietimo 4.0“ koncepcijos komponentus ir principus popandeminėje eroje.

Rezultatai. „Skaitmeninio švietimo 4.0“ koncepcija tampa svarbiu etalonu kuriant modernią švietimo sistemą, galinčią veiksmingai įveikti popandeminio pasaulio iššūkius. Jame numatoma pereiti prie novatoriškų švietimo modelių, grindžiamų Ketvirtosios pramonės revoliucijos technologijų, tokių kaip dirbtinis intelektas, daiktų internetas, didieji duomenys, virtuali ir papildyta realybė, integravimu. Šios priemonės ne tik daro švietimą lankstesnį, prieinamesnį ir efektyvesnį, bet ir padeda ugdyti kritinį mąstymą, skaitmeninį raštingumą bei prisitaikymo įgūdžius, būtinus sėkmingai karjerai sparčiai kintančioje technologinėje aplinkoje.

Tyrimas rodo, kad nors sėkmingi skaitmeninimo modeliai švietime jau egzistuoja skirtingose šalyse, „Skaitmeninio švietimo 4.0“ įgyvendinimas Ukrainoje reikalauja pritaikyti šias praktikas prie nacionalinės specifikos. Svarbu teikti pakankamą paramą infrastruktūrai, rengti mokymus mokytojams ir didinti mokinių skaitmeninio raštingumo lygį. Be to, būtina toliau tobulinti reglamentavimo sistemą, kad būtų apsaugotos skaitmeninio švietimo platformų naudotojų teisės ir privatumas. Rekomendacijos padės įgyvendinti efektyvų „Skaitmeninio švietimo 4.0“ modelį, kuris atitiks šiuolaikinio pasaulio iššūkius ir užtikrins lankstų, prisitaikantį bei kokybišką ugdymo procesą. Apskritai „Skaitmeninio švietimo 4.0“ koncepcija gali skatinti įtraukią, individualizuotą ir saugią švietimo aplinką, atitinkančią šiuolaikinės visuomenės poreikius. Šios koncepcijos įgyvendinimas bus svarbus žingsnis plėtojant į ateitį orientuotą Ukrainos švietimą ir padės sukurti sąlygas kokybiškam švietimui, prieinamam kiekvienam studentui, nepriklausomai nuo gyvenamosios vietos ar socialinės padėties.

Raktiniai žodžiai: „Skaitmeninis švietimas 4.0“, popandeminė era, koncepcijos principai.