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COVID-19 pandemijos poveikis aukštojo mokslo plėtrai


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Abstract: The main research directions of the situation in European higher education and Ukraine such as emergency transition to distance learning and teaching; problems related to internationalization and academic mobility; the impact of COVID-19 pandemic on research; the importance of cooperation with various organizations; strengthening of European higher education at the international level; and consequences of the crisis and prospects for higher education have been defined. The threats and potential emergence of destabilizing natural circumstances for the development of educational systems in a society, in particular higher education, have been described in global, European and national dimensions.

Four groups of teachers that have been formed in forced transition to distance education. The groups have included the teachers of the subjects that required a significant amount of practical and laboratory work; teachers who actively used digital technology before the pandemic; teachers familiar with digital technologies; teachers who failed to master new tools for organizing learning, teamwork and expanded use of digital resources. The problems of the lack of professionally developed programs for online learning, insufficient funding, the need for methodological training of teachers to work with students online, which are common to most universities, have been identified.

Keywords: COVID-19, European higher education, instructor of higher educational institution, pandemic, student.

Summary: Tyrimo apibrėžiamos pagrindinės Europos aukštojo mokslo ir Ukrainos situacijos tyrimų kryptys, pavyzdžiui, skubus perėjimas prie nuotolinio mokymosi ir mokymo; su internacionalizacija ir akademinio mobilumo susijusios problemos; COVID-19 pandemijos poveikis tyrimams; bendradarbiavimo su įvairiomis organizacijomis svarba; Europos aukštojo mokslo stiprinimas tarptautiniu lygmeniu bei krizės padariniai ir aukštojo mokslo perspektyvos. Pasauliniu, europiniu ir nacionaliniu mastu aprašomos destabilizuojančių gamtinių aplinkybių grėsmės švietimo sistemų, ypač aukštojo mokslo, plėtrai.

Tyrimo dalyvavo keturios grupės mokytojų, turėjusių priverstinai pereiti prie nuotolinio ugdymo – mokytojai tų dalykų, kurių mokant yra nemažai praktinių ir laboratorinių darbų; mokytojai, kurie prieš pandemiją aktyviai naudojo skaitmenines technologijas; mokytojai, kurie buvo susipažinę su skaitmeninėmis technologijomis; mokytojai, kuriems nepavyko įvaldyti naujų mokymosi organizavimo, komandinio darbo ir išplėsto skaitmeninių išteklių naudojimo priemonių. Tyrimas atskleidė daugumai universitetų būdingas problemas – profesionaliai sukurtų nuotolinio mokymosi programų trūkumas,

nepakankamas finansavimas ir dėstytojų metodinio rengimo nuotoliniam darbui su studentais poreikis.

Keywords: COVID-19, Europos aukštasis mokslas, aukštosios mokyklos dėstytojas, pandemija, studentas.

Introduction

The COVID-19 pandemic has affected absolutely all forms of human interaction and cooperation, significantly changed the world picture, necessitated adaptation to new life conditions, caused social and economic destabilization, and destroyed the sense of life security.

Higher education is one of those spheres that have been significantly affected. During a short period, higher educational institutions had been forced to switch to distance or blended learning. Because of the quarantine measures caused by the spread of the COVID-19 pandemic, there arose a need for a radical change in the forms and methods of teaching, methods of interpersonal communication, and the organization of the educational process.

Education issues are one of the top priorities of any society during the COVID-19 pandemic. After all, it is education that provides support and protection of the basic values of society, forms a sense of security and prospects for development, and affects the psychological state of society. The informational and psychological aspects of education associated with the formation of mass consciousness are important in this context (Sukhenko & Lukianenko, 2007).

In addition to psychological security, education contributes to ensuring the social security of humankind and society, as well as economic stability, so the adequate and professional educational policy of the state as a whole depends on the ability to overcome the crisis. According to O. Harashchuk (2020), “Education is a strategic resource of socio-economic, cultural and spiritual development of society, improving the welfare of the population, ensuring national interests, strengthening international prestige, forming a positive image of the country, strengthening its competitiveness in the international arena, and creating conditions for personal self-realization” (Harashchuk, 2020). Thus, education in the context of the COVID-19 pandemic requires a roadmap for solving urgent problems and adapting to the new reality.

The **aim** of the article is to analyze in global, European, and national dimensions the threats, potential opportunities, and impact that destabilizing natural circumstances has on the development of educational systems in a society, including higher education, based on studies of the educational organizations from different countries. The following **tasks** have been defined:

- to analyze the studies of the world organizations regarding the impact of COVID-19 pandemic on higher education;
- to characterize economic, social and psychological aspects of the impact of COVID-19 pandemic on higher education;

- to identify the tendencies in development of higher education based on the analysis of the European studies;
- to outline the main problems in higher education and recommendations for its development.

Method

In order to determine the main directions of research on the current situation in higher education, we used the following research methods: **secondary analysis** and **interpretation** of sociological data; **systematization and classification** of used theoretical and factual material; **analysis of the experience** of higher education in the conditions of extreme transition to **distance mode**. **comparative analysis** with foreign experience; **prognostic analysis** for determination of the prospects for further research.

Literature Review

In order to identify the impact of the COVID-19 pandemic on the development of educational systems in global, European and national dimensions, we have analyzed the studies conducted by various educational organizations. It was determined that the educational community has consolidated its efforts to ensure the functioning of the higher education system in the pandemic conditions. In a short time, various educational organizations have conducted research to analyze the impact of the COVID-19 pandemic on higher education.

Among the studies of the impact of the COVID-19 pandemic on education conducted by educational organizations, it is necessary to distinguish the following:

1. Studies concerning the COVID-19 pandemic influence on students and teachers (Global Learner Survey, 2020; COVID-19 Social Science Lab, 2020; So sehen die Lehrkräfte die Corona-Krise in der Bildung, 2020);
2. Studies on the students' health (Studie zur Gesundheit der Studierenden in Zeiten der Corona-Pandemie, 2020; Eysenbach et al., 2020);
3. Studies of the COVID-19 pandemic consequences for the universities (How Universities are Addressing the Coronavirus. Crisis and Moving Forward, 2020; Corona-Folgen für die internationale Hochschulwelt, 2020; Jump, 2020; Barannikov et al., 2020);
4. Studies concerning the COVID-19 influence on science and higher education (Aksoy et al., 2020; Auswirkungen der Corona-Pandemie auf Hochschulen und Studium, 2020; Studie: «Lernen unter COVID-19 Bedingungen», 2020; Marinoni et al., 2020; Schmermund, 2021; Altbach, 2020; Bai-Yun, 2020; COVID-19 and higher education:

Today and tomorrow. Impact analysis, policy responses and recommendations, 2020).

Analysis of the content and results of these studies has allowed us to conclude the following.

- Students and professors evaluate the situation differently. Generally, students have a positive attitude towards distance education, in contrast to teachers.
- Despite the positive students' attitude to distant education, respondents lack personal contacts, which has negatively affected their health. Professors have also had health problems, which is connected with psychological stress and increased workload associated with transition to distant education.
- Universities have suffered significant financial losses due to a decrease in the number of international students.
- Along with the spread of the COVID-19, distrust to the scientific researches has grown in the society. As a result, the need for open access to scientific researches has increased. It has turned out that education is becoming less accessible to the average person.

According to UNESCO, 1.5 billion students and young people on the planet have been affected by the closure of schools and universities due to the spread of the COVID-19 pandemic. In order to protect the rights to education during this period, UNESCO has established the Global Coalition for Education, which aims to ensure an appropriate level of education through partnership and mutual exchange (UNESCO, 2020). The coalition's main tasks have included addressing the problems related to the Internet and its content; providing digital tools for ensuring education, protecting privacy and following ethical standards, improving technical knowledge, managing digital learning, mobilizing resources and implementing innovative solutions for distance learning. Coalition partners such as Microsoft, GSMA, Weidong, Google, Facebook, Zoom, KPMG, and Coursera provided resources and expertise in the field of digital technology and digital capacity building. In addition, measures have been developed to respond to the COVID-19 pandemic in the field of education, namely, psychosocial support, digital learning management systems, platforms for open online courses, content for self-learning, platforms for real-time video communication, and digital learning content for teachers (UNESCO, 2020).

Results

The International Association of Universities has initiated a global study to analyze the situation in higher education at the regional and national levels in Asia, Europe and North America and two provisional reports have been presented by the IAF (Regional/National Perspectives on the Impact of COVID-19 on Higher Education, 2020).

1. The IAU First Global Survey Report on the impact of COVID-19 on Higher Education around the World. At present, the IAU is working on completing the second report about the Global Survey.
2. Report on Regional and National Perspectives on the Impact of COVID-19 on Higher Education.

Both reports have been focused on analysis of the short-term effects of the pandemic on higher education on a global scale. The survey conducted by the International Association of Universities has been unique due to its attempt to reflect the impact of COVID-19 on higher education at the global level, analyzing the activities of universities around the world. This survey is not a complete or comprehensive analysis of the impact of COVID-19 on higher education. However, this is the first analysis of the phenomenon at the global level. The survey has covered 424 complete responses from the higher education institutions in 109 countries and 2 special administrative regions of China (Hong Kong and Macao).

It should be noted that the results have been analyzed not only at the global level, but also in four regions of the world (Africa, America, Asia and Pacific region and Europe).

The survey revealed that almost all higher education institutions have been affected by COVID-19. More than half of them have ceased operations or closed completely. Almost all higher education institutions have switched to distance learning, despite the problems of technical infrastructure, competencies and problems related to the specifics of certain areas of education.

The closure of borders has led to a sharp decline in academic mobility and funding for international projects. The most common consequence of COVID-19 has been the cancellation of international travel and the cancellation or postponement of scientific conferences. At the same time, the forced transition to distance learning has opened up new, more flexible opportunities for education, such as blended or hybrid learning, a combination of synchronous and asynchronous learning. COVID-19 has increased virtual mobility and / or online learning as an alternative to student physical mobility.

It should also be noted that academic mobility includes the problem of teaching students among whom there is a special category – students with special needs. Such students require support from their family and relevant staff. In addition, there have arisen difficulties for foreign students who have been forced to stop their studies or stay in a foreign country for the period of quarantine.

With the spread of COVID-19 in society, distrust in scientific research has grown. Aksoy et al. (2020) have noted that the COVID-19 pandemic has called into question the value of scientific research. The authors have investigated the impact of previous epidemics on human confidence in science and scientists and have found out that previous epidemics did not affect people's views on science and science. That is, that despite the epidemic, it was deemed necessary to engage in science, as well as disease research, as an important component of science. However,

trust in scientists and the results of their work is declining. One of the consequences of this situation is the growing need for open access to the scientific research.

Educators from all the analyzed countries have recognized and emphasized the importance of cooperation with various organizations. Their arguments have been that after all, there are subjects that require laboratory work, practical experience, and external cooperation. Therefore, distance learning cannot provide effective mastery of all subjects without exception. During the COVID-19 pandemic, some higher education institutions have been forced to suspend cooperation due to the impossibility of physical presence and due to the deterioration of their economic situation. As a result, some of them have been forced to cease their activities. However, many higher education institutions have managed to maintain this line of work and provide students with practical professional skills.

In addition to the above-mentioned issues, we would like to draw attention to the economic, social, and psychological dimensions of the problems of education.

The *economic dimension* of the issue is that education is functioning through the sources of funding provided by the state, foreign students, students who receive education on a contract basis, and universities' own sources. In addition, educational institutions receive money that students pay for dormitories, food, renting cafes, student canteens, souvenir stores and bookstores.

The COVID-19 pandemic has dramatically changed this picture, when the share of international students has been significantly declining around the world, and all other income sources have been lost. A decline has also been noted in the financial capacity of students due to objective social circumstances and the situation on the labor market. Cases have often been noted when students have demanded a reduction in tuition fees.

In Ukraine, the number of foreign students who were a potential financial resource in the 2019-2020 academic year was more than 63 thousand. Due to the consequences of COVID-19, the share of foreign students has been declining worldwide and in Ukraine in particular, which meant limited financial flow. The activity of the world's leading universities has shown the large-scale financial losses. It is necessary to understand that education is a business that significantly affects the economic level of any state's development at the present stage and provides the financial stability of the state in the future (Ukrainian National News. Informational Agency, 2019).

The economic consequences for education are the lack of specialists in certain fields, which in the conditions of a pandemic need new knowledge, skills and specialists. This situation in turn would cause other crises of a financial and social nature.

The *social dimension*. Social distance has significantly reduced educational opportunities. By social distance, we mean the lack of access to basic services due to certain external reasons, including lack of access to education. In a digital society, people with limited access to digital

infrastructure have automatically found themselves in social isolation, which has been the cause of social inequality. It has been shown, among other things, in digital inequality. The Sociological Association Report states that “digital inequality significantly limits the chances that some people have in life, as they don’t have access to the virtual reality, the data bases and the online sources that would allow them to enjoy many benefits of modern civilization.” (Sociological Association of Ukraine, 2018).

The *psychological dimension*. In the conditions of a digital society, the students who have limited access to the digital infrastructure and the Internet automatically find themselves in social isolation, which is the cause of social inequality, as well as emotional and psychological problems. The biggest challenge for current instructors and teachers has become to quickly master the skills of using digital platforms and cloud technologies. In addition, excessive stress in society, lack of reliable information, new work tasks, unpreparedness of teachers and students for the new reality, communication 24/7, and the absence of a culture of digital communication have become just some of the stressors faced by the current teachers and students.

In the conditions of the pandemic, teachers and students have been forced to work overtime, their usual mode of work has been violated, all health norms have been exceeded in terms of the time a person should spend on the Internet. That is why psychologists and doctors have started to talk about the “digital diet” as a means of maintaining mental and emotional stability, as well as physical health.

There are various definitions of the term “digital diet” in psychological literature. Digital diet has been understood as a competent and selective approach to the selection and consumption of useful information (Khanenko, 2020); use of electronic devices and technologies to the reasonable and comfortable limits for each Internet user (Siberg, 2016).

The basic principles of digital diet in the conditions of distance education have been identified. Among them: management of information load, when educational material should be selected optimally considering the educational topic and the time required for its processing in digital format; politeness and ethics with a clear time frame for correspondence, calls, communication online, chat, social networks between teachers and students; so-called detoxification or relaxing day / time.

We would like to point out that in order to analyze the medium- and long-term effects of the pandemic on higher education, the International Association of Universities plans to publish two additional editions of the Global Survey. The study plans to cover issues related to changes in the functioning of higher education institutions, as well as the ways of adaptation of higher education institutions in the context of the COVID-19 pandemic. The next study has been scheduled for 2021 and should predict the long-term effects of the pandemic.

Discussion

The analysis of the impact of COVID-19 on higher education in the global dimension has shown that distance education remains relevant for most higher education institutions today. Therefore, ensuring proper online conditions for studying has been a key strategy in response to COVID-19.

The analysis of the European research on the impact of the COVID-19 pandemic on higher education analyzed above in our article has revealed some trends. The first trend is the growing popularity of online studying. This form of education will become a vital part of the further development of higher education. In order to ensure the effectiveness of distance learning, teachers must master the recent teaching methods, including online teaching.

The next trend is an increase in demand for shorter and cheaper studying courses. To date, the length of time to obtain higher education ranges from four to 5.5-6 years. Given the rapid pace of development of any society, this length of time to obtain an education will soon lose its relevance, and after all, education should focus on professions that will be relevant in 10 years. Instead, current education systems focus on professions that are popular today, and the specialties, which have been acquired over a long period of study often lose their relevance even before graduation. The Dell Technologies report has stated that “85% of the specialties of 2030, which will include Generation Z and Alpha, have not yet been invented” (Trade Union of Education and Science of Ukraine, 2020). In addition, higher education for the average person is becoming less accessible, as it requires significant financial costs. In this context, it is worth emphasizing the huge potential of companies that organize free courses, seminars, trainings and thus have a chance to provide themselves with qualified staff.

According to the forecast of the analytical company Oxford Economics, by 2030, about 20 million factory workers in the world will change jobs (Cooper, 2019). In addition, according to the conclusions of the World Economic Forum 2018, by 2022, more than 75 million people will lose their jobs (The Future of Jobs Report, 2018). However, these forecasts are rather contradictory, and they need more in-depth critical analysis. Universities now have a competitive advantage over other types of education, as many companies still require a diploma of higher education. However, nowadays we notice a tendency to lower the importance of having a diploma due to the modern conditions and requirement of labor market. Among them are long duration of the educational program needed for receiving academic education; probability of losing the relevance of the profession during the period of studying; need to master more than one profession in a lifetime; a diploma loses its importance for employment; the emphasis is put on skills rather than diplomas (Prystai, 2020). Therefore, universities should already develop and update educational programs that will have advantages over

other forms of education to ensure the competitiveness of graduate on the labor market.

Analyzing the impact of COVID-19 on the development of higher education in Ukraine, we have noted that, despite such difficulties as social isolation, lack of face-to-face learning opportunities, social tensions, economic crises, lack of reliable knowledge about the real state of matters, low level of analytical thinking, unequal access to quality Internet, low level of digital awareness, the system as a whole has remained operational. The transition to distance education has made it possible to ensure the interaction of students and teachers in order to perform educational tasks.

Educational activities have been carried out in three formats, such as asynchronous or correspondence (students study at a time convenient for them in accordance with the terms set by the program); synchronous format, which involves the simultaneous participation of teachers and students; mixed, which is a combination of the previous two formats, depending on needs.

Some educational institutions successfully practiced distance education even before the quarantine. However, most institutions have carried out their main activities in person and / or in the correspondence form. A number of problems have arisen due to the introduction of total distance learning format in higher education institutions of Ukraine in the pandemic conditions.

The first problem is connected with the availability of hardware. Lack or improper condition of computer equipment, lack of Internet (for example, in rural areas) makes it impossible to use distance education. For instance, nowadays in Ukraine we are witnessing the so-called “digital divide”. According to the official data of the National Commission for State Regulation of Communications and Informatization, 1.4 million (27%) out of 5 million of the fixed broadband Internet subscribers is concentrated in Kyiv, and together with the oblast it is more than 30%, although only 11% of the population lives in the capital region. This situation has significantly deepened inequality in the rights and opportunities of the population and led to social injustice and economic disparity (Shelest, 2017). The situation has not changed significantly in 2020. According to a report by the Ministry of Digital Transformation of Ukraine, 65% of villages do not have broadband Internet access (Economic Truth, 2020). However, we notice a positive trend. The Deputy Minister for Digital Infrastructure Development of the Ministry of Digital Transformation O. Shelest has informed that the Ministry’s plans for 2021 have included providing access to the fixed Internet to 3,000 villages (Shelest, 2021).

The second problem is challenges with software use. Even with the necessary hardware, installing software for distance education has been difficult for the users. The third issue is the lack of methodological training of the teachers for the distance format of education. This format requires special teacher knowledge and skills. The teaching methods suitable and used for full-time studying are not suitable for distance education. Therefore, the problem is that often all classes are conducted in the form

of a teacher's monologue and students' independent work. Resolving this issue is an urgent problem.

The transition to digital education has proved to be the only way to continue efficient education. During the quarantine period, many teachers and students made full use of digital technologies for teaching and learning purposes for the first time. The report "Rethinking Education in the Digital Age", conducted by the European Parliament in 2020, stated that the central issue of modern policy should be in rethinking the role of education in the digital age, namely: only education can form qualified professionals in the emergence of new professions and labor market transformations; education forms the preconditions for social integration and equal participation of citizens in the conditions of digital democracy (Europarlament, 2020).

We agree with the opinion of foreign researchers that after the forced transition to distance education teachers can be divided into four groups (Barannikov et al., 2020). The first group consists of the teachers of the subjects that require a significant amount of practical and laboratory work. In most cases, such teachers have not done any serious substitution of teaching methods. On average, they make up about 5% of the total. This group of the teachers strongly oppose the use of distance learning and new technologies in the future.

The second group consists of the teachers who had actively used digital technologies (including online courses and resources) before the pandemic. They have been able to quickly expand the use of conventional means of communication, the creation of digital resources, and learning management systems. According to Barannikov et al. (2020), their share is about 25%. This group generally supports the expansion of distance learning and believes that the quality of online learning can be equated with the quality of offline learning.

The next group is combined from the teachers familiar with digital technology (including outside of professional activities), who know how to search for information on the Internet and communicate by e-mail. Such teachers (up to 50%) have quickly mastered new tools, including synchronous learning, but this has required considerable effort. In general, the representatives of this group do not support a significant expansion of online learning (including the use of online courses of leading open education platforms), but in some cases they see the possibility of using communication technologies, educational management systems, and additional digital learning resources.

The last group consists of the teachers who have not been able to master new tools for organizing teaching, for teamwork and expanded use of digital resources. They have actually switched to teaching by correspondence. Their share is from 5% to 30% depending on the institution. For these teachers, the experience of transition turned out to be very difficult. They do not believe either in the effectiveness of the distance format, or in their own ability to learn new educational technologies.

Thus, the problems of technical nature and methodological training of the specialists to some extent have complicated the effectiveness of the educational process. However, they have created a field for finding new and alternative forms of cooperation between specialists in humanities and various technical fields. The digital competence of the teaching staff has ranked first among the skills and abilities that teachers need to improve and develop.

We consider it expedient to strengthen the foreign language competence of teachers. During the quarantine period, new opportunities for the professional development of teachers have been created, and free information resources in foreign languages have been opened. However, insufficient knowledge of foreign languages is a barrier to the professional development and general prospects of teachers. In addition, it reduces the level of general awareness and does not contribute to a comprehensive analysis of the situation, significantly decreasing the number of useful external sources for information analysis and study of international expertise.

The adaptation of plans and programs to distance education, as well as the adequacy of testing methods for the activities of both teachers and students during the quarantine period has also been an important issue. Methods of testing are an objective indicator of the efficiency of the entire educational process. They cover not only the forms of testing, but also have a so-called preliminary stage, to which we also include the forms of assignments, presentation of educational material, the volume and time for its processing, taking into account the target audience, and so on. In this context, the opinion of HEI students is worth noting on these issues.

A significant part of HEI students have been dissatisfied with the quality of education due to the following factors: an increase in the number of tasks and a short time for their implementation, poor quality of tasks, lack of some teachers' skills to work with online resources, similarity of tasks etc. It is obvious that the forms of testing need to be changed for greater objectivity. The objectivity of testing methods (exams, tests, defense of graduation theses, etc.) requires special attention. Therefore, the successful experience and best practices of higher education institutions in the EU countries should be used by the national education system of Ukraine. After all, the development of testing forms is a complex phenomenon, based on many components, including the attitude of HEI students to both forms of education and forms of testing. Requirements for the level of education and the level of teaching have been growing in accordance with the requirements of the contemporary labor market.

Student youth are acutely aware of the dependence of their future life on the level and quality of current education. I. Kohut, Y. Nazarenko and O. Sirba, in the study of the consequences of the pandemic for the educational system, have noted that people with quality education find jobs easier, have better working conditions, earn more, integrate better into society, are more involved in public and political life, and are more

actively involved in the development of a truly democratic society (Kohut et al., 2020).

Distance education in Ukraine has a number of significant advantages. Among them are the ability to improve skills online, which saves time and funds, especially when it comes to foreign internships and training; the opportunity to reach a larger audience during conferences and webinars; the possibility to hold joint meetings of departments, councils, and promptly resolve organizational and other issues, etc.

National and global problems of education have been very similar, but for us the priorities are the development of national education and the potential of current education. We must note that no fundamental research has been conducted in Ukraine on the impact of the COVID-19 pandemic on higher education in general, and on digital education in particular.

The analysis of the problem has been complicated due to the lack of available objective data. We agree with the opinion of V. Bakhrushin that the available data have a complex structure and different formats, which are often insufficiently complete and relevant or incomparable with the similar data from other countries. For these and other reasons, they are not very suitable for use in making many important decisions (Bakhrushin, 2020).

We assume that digital education has results similar to the ones in traditional education. However, there are no present studies of the factors determining its success. Creation of a methodology for determining the effectiveness of digital education, criteria for the effectiveness of digital education, forms of testing and demonstration of competencies is promising. However, the theoretical and statistical base proving the effectiveness of digital education is insufficient. Thus, we cannot say that digital education is a panacea for all problems, but the introduction of digital education in the implementation of basic principles, clear objectives, goal setting and development strategies is a very real task to be executed.

Conclusions and recommendations

The analysis has allowed us to conclude that for the development of higher education, the threats and potential opportunities of destabilizing natural circumstances in society are different depending on the country. After all, in different regions the development of higher education has its own peculiarities. However, there are trends common to all higher education institutions. Among them: assistance, support and participation of the state and state authorities of all levels in the implementation of the principles of digital education; large-scale use of digital technologies of teaching and learning; development of digital skills and competencies, and formation of digital communication culture; improving the quality of education through the analysis of statistical data; analytics in the education system and strategic forecasts; formation of resilience and counteraction to crisis situations; systematic thinking

and scientific and critical perception of the world; ability to work and live in conditions of coexistence of various intercultural and age groups; building contacts in real life and distinguishing between real live and fake live; accumulation of emotional intelligence and focusing on individual mental characteristics and features. Age characteristics, from this standpoint, is a fundamentally important category of information presentation, its proper structure and form; combination of face-to-face education and distance education (offline and online), flexibility, creativity and digital awareness of teachers; focus on the needs of target groups with consideration of changes in behavior patterns of students.

Most higher education institutions had had the necessary infrastructure and online teaching experience and had used digital technology before the COVID-19 pandemic, which had allowed functioning of the educational process. At the national level, normative documents have been developed that have allowed switching to remote operation (Bakhrushyn, 2020). Information support of teachers and students has been organized. Measures have been taken to provide economic support to higher education institutions. The challenge for many developing countries has been to limit the growing inequality of access to education and the lack of methodological training for teachers. The training of specialists in medicine, technical fields (engineering), IT-technologies, culture and arts have become commonly important for all countries (Prystai, 2020; Shelest, 2021).

The extraordinary situation that has developed today has the potential for bringing education out of the comfort zone. Proper self-diagnosis and self-analysis will allow educational institutions to test the effectiveness of existing digital solutions, determine their needs for technological modernization, provide retraining of teachers, identify strategies for further development, stabilize the educational sphere and bring it to a new level of quality.

There have been obvious changes in the demand for education, which have stimulated the development of new models and forms of learning, the transformation and flexibility of the educational space, expanding educational boundaries, increasing information resources, revealing new potential for education, teachers and students, and reducing costs of education, etc.

The transformation of education caused by the pandemic has been in practice a complex issue that has required synergy and cooperation of many stakeholders. Such parties are the state as a whole, politics, educational institutions, students, faculty members, businesses and economies.

The state acts as a guarantor of the country's security, under which in our study we mean access to quality education in a pandemic and post-pandemic reality. Policies should ensure and support the adoption of laws on digital education, whereas educational institutions and teachers should focus their efforts on developing new principles of education and reflecting them in new curricula.

Students, as the consumers of the educational services, and the executor of the tasks set by the new reality in the future, must be guaranteed to receive a quality education. Representatives of business and the economy, taking into account the pace of digitalization of society and the inconsistency of education to these challenges, should, based on analytical studies, develop a long-term plan for priority innovative professions.

Since a significant percentage of teachers have some negative attitudes towards the online learning format, it is necessary to develop effective online programs that can fully replace face-to-face learning, make it interactive, and not just transfer information to digital format. This requires specific knowledge and IT-skills. In our opinion, the development of such programs requires the combined efforts of IT professionals and the specialists in the field of various disciplines of higher education. In addition to the development of programs, methodological training of teachers for online teaching, and practical training for teachers, mastering modern Internet technologies is also required.

The introduction of short-term forms of teachers' in-service training will serve to solve some problems. At these trainings, the instructors would present different forms and methods of teaching for distance education, describe the features of distance education, such as technical, visual, psychological, methodical, etc.

Equal access to higher education is a very important factor. To ensure it, the state, at the legislative level, as well as educational institutions must provide access of all segments of population to the digital infrastructure, regardless of social origin, intellectual level, and financial capabilities. However, access to digital infrastructure is not automatically limited to Internet access. This should be a complex approach from fully developed platforms, with optimal tools to utilize platforms and with methods developed to determine precisely the criteria used to measure efficiency.

In practice, this can be achieved by creating a single digital market for services and knowledge that would help adapt to the changes associated with the digital transformation. Effective education in pandemic conditions can be achieved by not only improving digital awareness and acquiring the necessary digital competencies. Other factors are creating a positive psychological climate for online communication, successful time management, work-life balance, and digital diet. These factors contribute to the stabilization of the situation in education and other spheres of public life.

From our viewpoint, at the micro level the development of methods for determining the criteria and effectiveness of education is promising. These include forms of testing and demonstration of competencies; strategies for training pedagogical staff; strategies for digital infrastructure. At the macro level, there is the introduction of a new model of education that will be able to respond flexibly to the challenges of the times. In such a model, it is necessary to foresee the possibility of combining traditional interaction between the participants of the educational process with the online developments for distance learning. The authors cannot claim that digital education is a panacea

for all problems, but the introduction of digital education in terms of basic principles, clear objectives, comprehensive analysis, goal setting and development strategies is a very real task and a contribution to overcoming the effects of the COVID-19 pandemic.

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