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COVID-19 Crisis and the Transition of Universities to Education 4.0

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POVZETEK – Cilj našega prispevka je raziskati ključne priložnosti in izzive za prehod univerz v digitalno nerazvitih državah na izobraževanje 4.0 ter dokumentirati probleme in rešitve, s katerimi so se soočali vsi udeleženci visokošolskih institucij v času pandemije, vse z namenom ustvarjanja učinkovite spletne učne skupnosti in prilagajanja elementov pedagoškega procesa študiju v skladu z industrijo 4.0. Glede na to, da vsaka kriza predstavlja prehodno težavno stanje v naravnem, družbenem in miselnem procesu in predstavlja oviro, torej pomembno spremembo, ki ovira normalno delo in posledično povzroči drug pojav, menimo, da je pravi čas, da uporabimo pandemijo kot priložnost in da bodo kot posledica večmesečnega boja za ohranitev osnovnih izobraževalnih postulatov postavljeni trdni temelji za novo dobo izobraževanja. Ob tem se pojavljajo številna vprašanja, na katera poskušamo odgovoriti, kot npr. ali bo izobraževanje 4.0 zahtevalo temeljno preobrazbo učnega okolja in kako bodo visokošolske institucije preoblikovale učne načrte za strokovni razvoj bodočih učiteljev. Odgovori niso enoznačni in enostavni, vsekakor pa temeljijo na izkušnjah, ki smo jih pridobili med samo krizo.

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ABSTRACT – The aim of the paper is to explore the key opportunities and challenges for the transition of universities in digitally underdeveloped countries to Education 4.0, and document the problems and solutions faced by all participants in higher education institutions during the pandemic; all with the aim of creating an effective online learning community, and adapting elements of the teaching process to studying in accordance with Industry 4.0. Given that every crisis represents a difficult transient situation in the natural, social and thought process, and an obstacle or significant change that interferes with normal work and causes another phenomenon as its consequence, we believe that the moment is right for the COVID-19 crisis to be used as an opportunity and, after months of struggle to preserve the basic educational postulates, for a solid foundation to be built for a new era of education. "Will Education 4.0 require a fundamental transformation of the learning environment? How will institutions redesign the curricula for the professional development of future teachers? What lessons have we learnt in education during the COVID-19 crisis?", are some of the questions the paper strives to answer.

1 Introduction

Technologically driven predictions about the future of higher education are usually enfolded in the language of technological determinism. While it cannot be denied that new developments in technology are shaping future societies, at the same time society is also shaping the way people choose to use and design future technologies. Thus, technology is not an external force independent of society. This means that there is a dynamic tension between the ways in which new technology could affect current practice and how students, teachers and their institutional cultures mediate in the way this technology is implemented (or not) in their own educational context. Simply put, it is technocentric

to think that technology itself will lead to fundamental transformations of the learning experience. The relationship between pedagogy and technology is far more complex.

If science and education used to hold the role of bearers of human development (Bacon's vision of science), today it is quite certain that they are irreplaceable "instruments" of (human) survival. We are witnesses to the fact that science and technology have penetrated into the very structure of social life and that they are not some extra-social instance – they have begun to construct a social being. This has proved that science and technology today belong to our social life and our life form. Who can thereby answer what is happening to us as living beings? It concerns the fact that today knowledge refers and applies to knowledge itself; that the revolution of management is at work; that knowledge has become a key factor in production. Drucker (1993) was still hesitant to speak of this society as a "knowledge society", but he agreed that it was a knowledge economy and a post-capitalist society. The society of today, in which science has taken over the main position of social power and production, is often called a knowledge society. It is a modern society in which the key assumptions are science and the results of scientific activity. The impact of knowledge on the development of society gained a new dimension at the beginning of the 21st century. In the present times, knowledge has become a resource that is more important than natural resources. Knowledge from certain areas plays a key role in the development of a country. The world market is characterized by gradual but accelerated globalization dominated by consumer demands for the individualization of desires. The modern tendencies of the development of market-economy countries have shown that education and the creation of human resources, when it comes to new technologies, are at the top of the priorities of national strategies for social, economic and technological progress. Contemporary technological processes are based on a highly educated population that is able to use all the available technology. Developed societies strive to create a "knowledge society". Knowledge is progressively creating the effects of creativity. Bearing in mind that the effects of education are reflected not only on individuals, but also on society as a whole, it can be said that knowledge is becoming a basic development factor. Thus, investments in education acquire the character of investments in human capital.

It has been noticeable for some time now that the educational practice does not adequately follow the changes in modern technology that are present in all segments of society. Technology, and especially information technology, affects all aspects of human life, from production to entertainment. Pedagogy mainly states these facts and absorbs the offered technologies, mostly due to the fact that it does not endanger its own existence. As a consequence of such behaviour, technologies, whose influence on the learning process has not been sufficiently researched, appear in teaching practice. In such circumstances, there are perceptions that glorify technologies in teaching, as opposed to perceptions that deny or even reject the need for greater use of technologies in the educational process. In this paper, we have tried to promote a new approach in pedagogy that should be based on a continuous "dialogue" between new technologies and teaching theory and practice. This idea is based on the need to analyse the potential of a specific technology in a specific scenario (teaching practice during the pandemic) and to decide on its application based on the obtained results. This process should be continuous. Pedagogy should consider the values of certain technologies, and not the other way around.

Even before the global pandemic emerged, many higher education institutions in developed countries were laying the groundwork for a new approach to higher education

by investing in new technologies and the professional development of teachers, which confirms some past research studies (Cvek and Pšunder, 2019; Dolenc Orbanić et al., 2016; Florjančič and Koselj, 2017; Müller and Kuprešak, 2018). Today, more than ever, the universities in digitally underdeveloped countries are facing an open question: do we want an education system that will adapt to social changes or an education system that will initiate or even manage such changes? Since we are striving towards improvement and the future, globalization is inevitable as one of the determinants of education and upbringing, with a tendency to create a European model of schooling. It is therefore inevitable that schooling is related to educational technology and the social context, e.g.: *education for quality interpersonal relationships; education for solidarity, tolerance, and democracy; education for work and responsibility; education for respect for human rights; education for meaningful communication and dialogue; education for creativity; education for healthy living*. How to achieve this in small countries with a relatively poorly developed economy and an underdeveloped education system, which is mainly based on taking other people's experiences into account without an in-depth analysis and a strategic approach to planning the education system in correlation with the economic development projection? It is obvious that there are no answers based on scientifically verified research results or at least the verified data of good practices. Most developed countries of the world have adopted the construction of a competitive knowledge-based economy as a goal. It seems that, despite attempts, our society has not yet paved the way for the creation of a knowledge society. This primarily refers to the fact that it is not possible to recognize a single thread that would connect the development of human resources (through the learning process) from preschool, through primary and secondary school to university, which includes acceptance of the concept of lifelong learning. Recognizing knowledge as a "raw material", that is, the most important resource for the development of society in which intellectual and innovative products and services appear as basic goods, will implicitly define not only the place and role of educational and social policies as an integral part of economic and other social policies, but also an invitation to research, create instruments, and monitor the results achieved. The industrial revolution has led to rapid and radical changes in many aspects of social life, such as labour, education, management, and everyday life (Blinder, 2006). Industry 4.0 denotes the fastest pace of change ever. The minor and major changes that occurred during the period of industrial revolutions (1.0, 2.0, 3.0, 4.0) have led to changes in almost every aspect of life. As the new characteristics of production changed the competencies of the labour force, social life had to develop accordingly. One of the subsystems in society that is seriously affected by these transformations is education. Consequently, with the changes in the production process and the reflections of these changes on social life, the content and concept of education gained new meanings. Some authors have called it the transformation of education. Education 4.0, which developed in the early 21st century, is expected to meet the needs of the age of innovation and the demands of Industry 4.0.

Education 4.0 is also called the process of producing innovation. Education 4.0 is a vision for the future of education, meeting the needs of Industry 4.0 or the fourth industrial revolution, where man and machine align to enable new opportunities to harness the potential of digital technologies, personalized data, open-source content, and the new humanity of this globally connected world powered by technology. It thus establishes a plan for the future of learning – lifelong learning – from childhood education, to con-

tinuous learning in the workplace, to learning to play a better role in society (Fisk, 2017). Advances in technology and the rapid development of the knowledge-based economy increase the demand for skills that will drive the future of the workforce. The transition of most countries to a knowledge-based economy requires a different approach to the development of the whole personality. Therefore, the holistic development of a person becomes a priority for most educational institutions, and the individual is required to have a different set of skills to solve complex problems. Given that Education 4.0 implies that learning can take place anytime and anywhere, that students can determine how they learn, as well as be independent in collecting, presenting and interpreting certain data, be self-aware and the like, the COVID-19 pandemic has "opened the door" to a new era of education in (digitally underdeveloped) countries by forcing schools and universities to quickly shift from face-to-face to online learning (Žgur and Jerman, 2022).

2 University response to the pandemic

In poor and undeveloped countries, but also in developing countries (such as the Balkan countries), we are often faced with social crises, which leave behind dramatic consequences. In such situations, no social institution is spared destruction. The COVID-19 crisis, which affected the whole world, raised the question of ensuring a minimum for the functioning of society and its institutions. One of the priorities is to ensure the teaching process in educational institutions and the protection of pupils, students and staff. The basic role of educational institutions is to ensure stability, because both students and teaching staff experience chaotic situations in their lives. When considering the history of pandemics, a long list of almost twenty previous pandemics during the course of history can be compiled. Throughout history, diseases have crushed humanity by changing the course of history, especially when entire civilizations have been threatened or even disappeared (Oven, 2020). On the other hand, today, every corner of the world is connected and cannot be put in complete isolation, so epidemics and pandemics are spreading rapidly on a massive level (McLeod, 2020).

The world's leading university centres immediately published plans and strategies for dealing with the current situation on their websites. For example, in the United States and many other countries, they swiftly organized workshops to introduce faculty to modern remote digital teaching and learning tools, which have made significant strides in terms of sophistication and productivity (Fernandez and Shaw, 2020). When reporting on how the Australian education sector reacted to the COVID-19 pandemic, Scull et al. (2020) describe in detail how an Australian university has implemented a number of innovations that have changed the way we teach, moving towards a fully networked environment for all initial teacher education programmes. Innovations included the conversion of all face-to-face course units into online units, including synchronous and asynchronous learning opportunities. In their study, Velle et al. (2020) present clear examples of how English higher education institutions have responded positively and creatively to protect and encourage their students. They point out that the opportunities for the development of a new pedagogy for online teacher education have suddenly opened up. Such top-notch moves by the crisis management of the first-ranked universi-

ties are expected and necessary, primarily due to immeasurable financial losses. Many theorists have pointed out the importance of a contingency plan for overcoming the crisis, but the applicability of the contingency plan depends on whether the company operates in a politically and economically stable environment (Duvnjak, 2017).

Universities in underdeveloped and poor countries mostly operate locally, with little or no international students. From a review of their online activities, it can be concluded that the basic principle was to continue the teaching activities until the end of the semester, while maintaining the health of the nation.

In order to prevent interruptions in education, during the first wave of the COVID-19 pandemic, which would inevitably lead to serious socio-economic consequences, universities from low-resource countries, including Bosnia and Herzegovina, moved to "emergency online teaching" (Hodges et al., 2020), which differs in meaning and manner of implementation from pre-planned online learning.

The provision of quality higher education services in general, and of those provided online, in particular, consists of a complex set of services, with many complementary and sometimes integrated services. These include content development and teaching design services; student support services; distribution and sale of learning resources; library services; research support; direct teaching; tutoring; registration services and sometimes social services, such as networking (Anderson and McGreal, 2012), while ERT involves the ultimate exploitation of available distance learning tools. Once the disaster or circumstances are mitigated, teaching will return to its original format (Mohammed et al., 2020).

Kupe (2020) points out that the majority of scientists who have studied the consequences of the pandemic on higher education believe that the pandemic has contributed to and ensured that higher education will become more digital in the future; that future learning will increasingly focus on "segments that can be matched"; that education will be "primarily timely and not just a backup"; that we must use the time of crisis to be innovative, proactive and adapt to the world after COVID-19; that leaders in higher education need to think about what the future of higher education will look like and take steps towards that goal. In some emerging (subcontinental) markets, the pandemic has "forced the adoption of online education". Where traditional teaching methods were the most accepted and "comfortable" form of performance and learning, the pandemic challenged the system and "forced" it to adapt. This has led to other challenges, such as the lack of necessary infrastructure and digital sharing due to "student disparities and electricity shortages" (Ewing, 2021).

These are all facts that have been known for a long time and that confirm the unbreakable ties and closed natural cycle between educational needs, the education system, and the labour market. Finally, the choice of school or college – and thus the profession or job which would be the basis for living, building a social status, reputation and career – depends on a realistic assessment of each individual's capabilities, skills, interests and desires, but also on objective circumstances that young people can have very little influence on. Objective circumstances impose large systems and the specific needs of individuals have little impact on them. Global society determines the directions of development; small communities like ours, or small countries do not have many choices. They will succeed only if they find ways to make the best use of their natural and human resources.

If we consider the rapid change in the scope of human knowledge and changes in the sphere of work, we come to the simple fact that a person is forced at least 6-8 times in his/her working life to supplement and upgrade his/her initially acquired knowledge for a profession, and sometimes even change occupation. We need to break loose from the illusion that schooling provides knowledge for the job chosen once and for all. It is obvious that education is still understood as a cost of the state, and not as an investment in long-term and sustainable development. Recommendations for continuous education in different societies are met with different reactions from the authorities, but it is usually the more developed societies that recognize the importance of education sooner. It should be borne in mind that structural imbalances in the labour market are a phenomenon characteristic of almost all economies in transition. However, if the labour market is ready for the emerging transition processes, the problems of educational, qualification or location mismatch between supply and demand in the labour market will be solved faster and more efficiently.

In order to bridge the existing gap between the education system and the labour market, closer cooperation, partnership and greater involvement of all stakeholders, employers, students and educators are needed.

We must take certain measures that will stimulate employers to invest in improving the knowledge of their employees in order to get them involved in the processes of technological change, because employers are creators of innovation processes and new jobs.

One way to achieve this is to form partnerships with higher education institutions. Apart from the fact that in this manner employers could be more directly involved in the educational process and influence it by transferring to students the knowledge and skills that the company requires from job candidates, students would also benefit from this system, because this kind of partnership would encourage them to be more successful, as they would know that only the best will have the opportunity to get a job in one of the companies. This partnership can be reflected in the provision of professional practice, volunteering or internship, but also of full-time employment. This would also make it easier for students to move from college to work.

Will Education 4.0 require a whole new approach to the professional development of future teachers?

For most teachers, adapting their well-honed curricula to online environments has presented challenges which they were not trained to overcome (Psotka, 2022). Bahasoan et al. (2020) and Fauzi and Khusuma (2020) argue that online learning is effective only if a number of conditions are met, including the readiness of both teachers and students, and the availability of online learning resources.

Teachers' ability to adapt to distance learning varies; thus, education system managers need to be aware of their teachers' competency levels and set their expectations accordingly (David et al., 2020). According to Chinese researchers Yang and Huang (2021), online education throughout the system during the COVID-19 outbreak provided a rare opportunity for all teachers to improve computer literacy. Whether actively or passively, during the pandemic, teachers learned to use technical software such as online video conferencing systems and intelligent teaching tools. However, some teach-

ers are satisfied with little knowledge of online teaching and tend to minimize the use of technical software. Some teachers just make a simple copy of the usual offline learning. They do not fully understand the technological benefits of online teaching nor do they think about using online educational technology to address the deficiencies of traditional teaching. Therefore, teaching still remains separate from technology. However, some teachers are willing to accept and internalize information and online teaching technology into their educational philosophy. The growing knowledge and understanding of tools have significantly influenced their attitude towards online teaching and have forced them to promote various innovations in online teaching using all kinds of tools.

Studying the attitude of teachers towards distance education during the pandemic, Ewing (2021) reveals a wide and diverse range of views on the roles of the Internet in higher education after the pandemic. He points out that, on the one hand, there are those who believe that the method of providing higher education services will change dramatically and permanently, and that most educational offers will be transferred from face-to-face teaching to an online or combined model. These shifts will also create opportunities for the education of students who previously did not have access to higher education, as accessible online platforms will have a greater reach in society. Some teachers are even more ambitious, and believe that radical changes in the learning environment will take place, which will mean permanently abandoning the traditional format of lectures. The other extreme, according to Ewing, were those who longed to return to the classroom and move away from the Internet. From a student perspective, the pandemic learning environment was very diverse and challenging, and as such required adaptability and resilience. However, the crisis provided an opportunity, namely to prepare students for coping in the living and working environment.

From a teacher perspective, this forced transformation was also stressful, as teachers had to adapt quickly to new online techniques, with little or no training in some cases and in record time (Dwivedi et al., 2020). Govindarajan and Srivastava warn that not all faculty members feel "comfortable in an online environment"; the generational gap has led to the isolation of those who relied on classical methods and never used technological tools from those younger faculty members who may be more skilled in new technologies (Govindarajan and Srivastava, 2020). The main difficulties in teaching during the pandemic that teachers pointed out were the high demand for specific skills, such as computer skills, specific communication skills for the online environment, proper handling of various learning tools, and the need to quickly solve specific problems during learning sessions. However, after an initial period of adaptation/experimentation, academics have highlighted some interesting recommendations for overcoming these difficulties (Dwivedi et al., 2020). Primarily, teachers need to create an appropriate physical environment for online teaching, including lighting and sound. The specific content of classes should be thoroughly redesigned in order to adjust the time schedule to online delivery and introduce group activities to motivate and engage students and encourage shared learning. As most universities will soon opt for a hybrid system that combines small face-to-face groups with online sessions, the challenge for teachers will be to ensure that students experience high-quality learning in both situations (Dwivedi et al., 2020), as teaching influences the way we think and act through the educational process (Bahasoan et al., 2020).

All of the above suggests that study programmes at all levels of teacher education in digitally underdeveloped countries should be revised in line with the requirements

of the new era of education. This certainly does not refer only to the development of digital competencies but also to the training of teachers to work in a completely different pedagogical and psychological environment.

How to provide pedagogically rich learning environments that engage and motivate students?

Among various theories related to distance education, Sangra confirms that the student is a basic element of any educational system (Sangra, 2002). Their specific needs and characteristics are the elements that determine the technology that will be used in the education model.

As a result of the physical distancing measures implemented in response to COVID-19, higher education institutions have switched to an urgent online learning format, which has, as expected, further exacerbated academic stressors for students. A survey (Young Minds, 2020) states that 83 % of young people surveyed agree that the pandemic has worsened their mental health, mainly due to school closures, loss of routine, and limited social contacts. Also, studies assessing the implications of COVID-19 for mental health have found an increased prevalence of depression and anxiety symptoms from moderate to severe, reflecting the broad effects of insecurity and fear (Wang et al., 2020; Cao et al., 2020).

Kamble et al. (2021) state that previous studies have also identified the benefits of distance learning from a student perspective. The benefits of this approach include enabling participation from around the world, improving computer skills through computer-assisted classes, facilitating critical thinking and practical application of knowledge, and providing opportunities to use higher-order skills such as problem solving and collaboration.

Although many problems were mentioned during the first experience of distance learning, the students also expressed satisfaction because they gained experience in a new transformed environment. Online learning that temporarily replaces conventional learning has enabled students to continue learning and developing, despite social distancing measures applied in many countries (Baber, 2022).

The ideal of the learner as an active co-creator of meaning is core to getting beneath superficial rote learning and realizing the transformative potential of education (Rospigliosi, 2022). Regardless of whether it is a crisis situation or not, the transition to a completely new format of learning, that is, stepping out of the comfort zone, causes discomfort and stress to the participants in the teaching process. Precisely because of this, it is necessary to create such an environment and a positive climate in which everyone will feel comfortable.

How to transform teaching contents to support online learning and skills development necessary for sustainable development?

Greater interaction with digital technologies deeply influences our daily, social, business and educational lives; however, this influence has deepened in the educa-

tional experiences of teachers and students after the COVID-19 pandemic (Bulut and Delialioğlu, 2022). Already prior to the pandemic, it has been researched and proved that innovative teaching methods used in distance learning help maintain students' interests and make the learning process more productive and interesting (Natarajan, 2005). According to Rajadurai et al. (2018), distance learning, the quality and efficiency of courses, and the efficiency of the Internet are among the factors that can have a positive impact on student performance. Distance learning provides students with a number of opportunities, including unlimited access to learning materials such as recorded lectures; networking with people from different geographical locations and different cultures; convenience in terms of time, actual duration, concentration, transport and expected cumulative probability. Kamble et al. (2021) point out that the transition to distance learning has not been without challenges, as many institutions and students depend on the availability of online learning platforms.

During the outbreak of COVID-19, achieving the educational goal of imparting knowledge through online teaching was usually a top priority. However, simply moving courses online and equating online education with online teaching are not enough (Yang and Huang, 2021).

The understanding of distance learning plays a crucial role in providing quality education and improving students' knowledge. The quality of distance learning includes various factors, including Internet connection, access to technology, infrastructure for holding sessions, and the participation and interaction of students and faculty teachers. According to Hofmann (2002), online learning is becoming increasingly important due to the availability and accessibility of Internet technologies. Learning environments differ in their design and execution depending on the learning objectives, target audience, approach (physical, online and/or both) and type of content (Moore et al., 2011). However, Mok et al. (2021) point to the alarming signal that simply copying conventional face-to-face teaching to an online format is not a wise move.

Learning theory suggests that learning is enhanced when students are actively involved in learning, when tasks reflect real-life contexts and experiences, and when critical thinking or deep learning is promoted through applied and reflective activities (Smart and Cappel, 2006).

For the benefit of students, facilitators need to be aware of information overload, maintaining activities at a manageable level, and constantly recognizing the importance of affective support as part of creating a student community (Maor, 2003). This refers to the proper sizing of requirements, in accordance with the individual capabilities of each student. Successful teaching is mainly a matter of establishing a balance between the educational potential of a particular activity and the degree of student engagement.

Students' experiences in teaching during the pandemic indicate that the amount of learning and working materials was too much for them. It is possible that the students themselves, due to lack of experience in this type of learning, failed to organize well, but also that teachers did not harmonize the requirements with the students' capabilities.

What challenges do information technologies pose for approaching Education 4.0?

Although technological innovations have created diverse opportunities for distance learning (Amirault, 2015), the transition from a familiar traditional face-to-face learning environment is a challenge for both teachers and students due to the complex nature of open educational resources (Chakraborty and Nafukho, 2014). Moreover, the global COVID-19 crisis has exacerbated the importance of a hidden form of social inequality, i.e., digital inequality (Beaunoyer et al., 2020).

The advantage of using a learning management system (LMS) during the pandemic, when universities were closed, is reflected in the fact that it has made students flexible and has prepared them for a possible manner of learning in the future. Students have adopted the concept of online education, and will use it even when educational institutions are open. Therefore, training and experience in the use of LMS will provide an excellent opportunity for educational institutions in terms of earnings and high income, as they can launch online courses along with regular classes (Raza et al., 2021). The problem of the simplicity and ease of use of technical means and learning systems arose because the modern information environment has become an integral part of the academic community. The flow of information has increased significantly, and so has the load on distribution channels. Teachers and students who fully communicated online were forced to intensively exchange emails, files, links, articles, organize video conferences, chats, etc. Therefore, it was necessary to develop the ability to find and structure the necessary data and information, and the ability to choose the most appropriate ways to share this data with others. To achieve this goal, electronic means of communication were used almost everywhere (Zharova, 2020). The most commonly used digital learning management systems at universities during the pandemic were Moodle and Google classrooms, while the most commonly used communication tools were Zoom, Skype and Teams (EPALE, 2020). The transition to online learning has also consequently created a digital learning environment for both teachers and students. For students who have access to digital devices and Internet infrastructure, switching to digital platforms was fairly easy during the pandemic. This lucky group of students could continue learning despite the growing challenges posed by COVID-19 (Mok et al., 2021). In addition to platforms intended exclusively for learning, social networks such as Messenger and Viber have been used as a channel of communication. McGreal (2004) points out that many institutions and organizations are currently developing digital lessons, modules and courses on common topics. Many similar lessons have been adapted for online delivery. This procedure can be time consuming and expensive, which makes sharing necessary. Downes (2000) argues that the world does not need tens of thousands of similar topics to learn: "Just as a shoemaker did not go out and kill an animal, skin it, select the desired pieces of leather and darken them for each commission, as he already had various pieces in stock that he could assemble to order, so a dozen sources of designed multimedia LOs can be used in thousands of courses". Internet courses should therefore be designed as a collection of LOs (learning objects) and not as whole, inseparable, long courses. In order to search for and find these LOs, descriptions of their characteristics are needed. For this, you need metadata that describes their many characteristics. Metadata is essential for addressing LOs (McGreal, 2004).

Precisely, teachers and students lack the basic knowledge about the possibilities and use of digital technologies and content in the most expedient way. The pandemic has

opened the door to the world of digitalization, but for the effective implementation of the entire teaching process, digitally underdeveloped countries will definitely have to invest both material and human resources to enter a new era of education.

3 Conclusion

The concept of Education 4.0 primarily implies learning that can take place anytime and anywhere, in which students can determine how and what they learn. The development of skills, such as independence in the collection, presentation and interpretation of certain data, self-awareness and the like, was accelerated by the situation surrounding the COVID-19 pandemic. It can be said that a "new era in education" has emerged, which in digitally underdeveloped countries has "forced" schools and universities to move quickly from face-to-face learning to learning using digital technology. The crisis caused by COVID-19 was a significant catalyst that encouraged the development of Education 4.0 due to the fact that such a situation required the use of information technology in the teaching process. The COVID-19 pandemic has in less than one year made this desired immersion in a predominantly digital learning environment a reality for teacher education programmes around the world (Power et al., 2022). The most important consequence is that all factors in the education system, from primary and secondary education to universities, "had to" accept and use digital technology. This ensures that all participants at all levels of education go through a similar digital experience, which will, in the future, make the transition from lower to higher levels of education easier.

It is evident that the crisis in the economy, the education and health system, the governance system, politics and lifestyle will regress the global community several years, and that society will have to rebuild itself in this new reality, but it is uncertain how long that will take. The creation of a new post-pandemic society will depend on many factors (politics, human behaviour, technology), but many scientists predict that education and its development are at the root of this "evolution". If any lesson is to be learnt from the COVID-19 public health emergency, it is that things will never be the same again and that all stakeholders in education, including student teachers, are resilient and adaptable to change (Farrell, 2021).

Acceptance of new technology is an overarching theme in our time, and it will affect every discipline (Greener, 2022). Futuristic trends are already emerging, accelerated by the pandemic. These include online teaching and learning, and the need for training. The pandemic has also accelerated the development of remote work, the adoption of 3D printing, artificial intelligence and robotics (Kupe and Wangenge-Ouma, 2020). The pandemic has also called into question the suitability and sustainability of university models of work, practice and systems. To survive and thrive after the pandemic, universities must re-evaluate and adjust their strategies. There has been much discourse around the pandemic serving as a lever for change, potentially opening up new possibilities for learning, teaching and assessment, and alongside this the tentative vision of an improved post-pandemic education system (Hall et al., 2021). Kupe and Wangenge-Ouma (2020) emphasize that we must use the time of crisis to be innovative,

proactive and adapt to the world after COVID-19, and that leaders in higher education must think about the future of higher education and take steps towards achieving it.

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Kriza zaradi pandemije covida-19 in prehod univerz na izobraževanje 4.0

Že dolgo nazaj so ugotovili, da izobraževalna praksa premalo sledi spremembam sodobne tehnologije, ki je prisotna v vseh segmentih družbe. Tehnologija, zlasti informacijska, vpliva na vsa področja človekovega življenja, od proizvodnje do zabave. Še pred pojavom svetovne pandemije so številne visokošolske ustanove v razvitih državah z vlaganji v nove tehnologije in razvoj strokovnih kadrov postavljale temelje za nov pristop v visokem šolstvu (Cvek in Pšunder, 2019; Dolenc Orbanić et al., 2016; Florjančič in Koselj, 2017; Müller in Kuprešak, 2018). Univerze digitalno nerazvitih držav se danes, bolj kot kdaj koli prej, soočajo z odprtim vprašanjem: ali želimo izobraževalni sistem, ki se bo prilagajal družbenim spremembam, ali izobraževalni sistem, ki bo spremembe sprožal ali jih celo upravljal.

Cilj dela je raziskati ključne priložnosti in izzive za prehod univerz v digitalno nerazvitih državah na izobraževanje 4.0 ter dokumentirati težave in rešitve, s katerimi so se v času pandemije srečevali vsi udeleženci visokošolskih institucij, vse z namenom ustvarjanja učinkovite učeče se skupnosti na spletu in prilagajanja elementov učnega procesa študiju v skladu z industrijo 4.0.

Eden od podsistemov v družbi, ki ga transformacije resno prizadenejo, je izobraževanje. Posledično sta s spremembami v proizvodnem procesu in refleksijami teh sprememb na družbeno življenje, vsebina in koncept izobraževanja dobila nove pomene. Nekateri avtorji so jih poimenovali izobraževalne transformacije. Izobraževanje 4.0, ki se je razvilo na začetku 21. stoletja, naj bi zadostilo potrebam dobe inovacij in zahtevam industrije 4.0.

Glede na to, da vsaka kriza predstavlja prehodno težavno stanje v naravnem, družbenem in miselnem procesu in predstavlja oviro, torej pomembno spremembo, ki ovira normalno delo in kot posledico povzroči drug pojav, menimo, da je pravi čas, da uporabimo krizo zaradi pandemije covida-19 kot priložnost, in da bodo kot posledica večmesečnega boja za ohranitev osnovnih vzgojnih postulatov zgrajeni trdni temelji za novo dobo izobraževanja. Bo izobraževanje 4.0 zahtevalo temeljno preobrazbo učnega okolja? Kako bodo institucije preoblikovale učne načrte za strokovni razvoj bodočih učiteljev? Kaj smo se naučili v procesu izobraževanja v času krize zaradi pandemije covida-19? To je le nekaj vprašanj, s katerimi se soočamo pri svojem delu.

V revnih in nerazvitih državah (kot so balkanske države) se pogosto srečujemo s socialnimi krizami, ki pustijo za seboj dramatične posledice. V takšnih situacijah nobena družbena institucija ni obvarovana uničenja. V času krize zaradi pandemije covida-19, ki je zajela ves svet, se je postavilo vprašanje zagotavljanja minimalnega delovanja družbe in njenih institucij. Ena od prednostnih nalog je bila razvoj pedagoškega procesa v vzgojno-izobraževalnih zavodih ter varovanje zdravja učencev, študentov in zapo-

slenih delavcev. Primarna vloga izobraževalnih ustanov je bila zagotavljanje stabilnosti, saj so tako učenci kot zaposleni v življenju doživljali kaotične situacije.

Univerze iz nerazvitih in revnih držav večinoma delujejo lokalno, z malo ali nič tujih študentov, iz pregleda njihovega delovanja v mrežnem prostoru pa je mogoče sklepati, da je bilo osnovno načelo, da se izvede pouk do konca študija oz. semestra ob ohranjanju zdravja. Da bi preprečili prekinitev izobraževanja v prvem valu pandemije covida-19, ki bi neizogibno povzročila resne socialno-ekonomske posledice, so univerze iz držav z nizkimi sredstvi, vključno z Bosno in Hercegovino, prehajale na "nujni spletni pouk" (Hodges et al., 2020), ki se po pomenu in načinu izvedbe razlikuje od vnaprej načrtovanega spletnega učenja.

Ne glede na to, ali je poučevanje potekalo aktivno ali pasivno, so se učitelji med pandemijo naučili uporabljati tehnično programsko opremo, kot so sistemi za spletne videokonference in inteligentna učna orodja. Vendar so bili nekateri učitelji zadovoljni s slabim znanjem o spletnem poučevanju in so se nagibali k zmanjšanju uporabe tehnične programske opreme. Nekateri učitelji so samo naredili preprosto "kopijo" svojega rednega učenja brez povezave. Niso popolnoma razumeli tehnoloških prednosti spletnega poučevanja, niti niso razmišljali o uporabi spletne izobraževalne tehnologije za reševanje pomanjkljivosti tradicionalnega poučevanja, zato je poučevanje ostalo nepovezano s tehnologijo. Na drugi strani pa je bilo nekaj učiteljev, ki so bili pripravljeni sprejeti in ponotranjiti informacijsko učno tehnologijo v svojo izobraževalno filozofijo. Povečanje znanja in razumevanja orodij je pomembno vplivalo na njihov odnos do spletnega poučevanja in spodbudilo uporabo različnih novosti v spletnem poučevanju z vsemi vrstami orodij.

Težave pri poučevanju v času pandemije so bile različne. Izstopalo pa je predvsem veliko povpraševanje po posebnih veščinah, kot so računalniška pismenost, specifične komunikacijske veščine za omrežno okolje, pravilno ravnanje z različnimi učnimi orodji in potreba po hitrem reševanju specifičnih problemov med učnimi urami. Učitelji so tudi morali ustvariti ustrezno fizično okolje za spletno poučevanje in nato temeljito preoblikovati učne vsebine, se prilagoditi časovnemu razporedu spletnega izvajanja in uvesti skupinske dejavnosti za motiviranje in pritegnitev učencev ter spodbujanje sodelovalnega učenja. Vse navedeno kaže na dejstvo, da bi bilo treba študijske programe vseh stopenj, ki so namenjeni izobraževanju bodočih učiteljev, v digitalno nerazvitih državah prenoviti v skladu z zahtevami novega obdobja izobraževanja. To zagotovo ne pomeni samo razvoja digitalnih kompetenc, temveč tudi usposabljanje učiteljev za delo v popolnoma drugačnem pedagoškem in psihološkem okolju.

Zagotovo sta vplivali na duševno zdravje mladih tudi popolna zapora in prepoved izhoda izven bivalne enote. Zato je bilo zelo pomembno ustvariti učno okolje, v katerem se je razvijal duh skupnosti in v katerem se mladi niso počutili osamljene. Ne glede na to, ali gre za krizno situacijo ali ne, prehod v popolnoma novo učno obliko, kar je izstop iz konformističnega okolja, povzroča pri udeležencih pedagoškega procesa nelagodje in stres. Ravno zaradi tega je treba ustvariti takšno okolje in pozitivno klimo, da se bodo vsi dobro počutili. Celoten spletni tečaj zahteva kompleksno zasnovo vsebinskega načrta, učna gradiva, kot so avdio in video vsebine, ter ekipe za tehnološko podporo. Zaradi nenadnega pojava covida-19 pa se je večina članov akademske skupnosti soočala s problem pomanjkanja izkušenj s spletnim poučevanjem, pa tudi pomanjkanjem podpore timov za izobraževalne tehnologije.

Iz predhodne predstavitve in izkušenj drugih avtorjev lahko sklepamo, da sta imela priprava in način podajanja učnih vsebin zelo pomembno vlogo v procesu učenja na daljavo. Pripravljalni proces je dolgotrajen proces in zahteva angažiranost vsakega udeleženca pedagoškega procesa. Najbolje bi bilo, če bi to dejavnost izvajali timsko in bi bilo vanjo vključenih več učiteljev istega ali podobnega področja.

Uspešna izvedba pouka je predvsem vprašanje vzpostavljanja ravnotežja med izobraževalnim potencialom posamezne dejavnosti in stopnjo angažiranosti učencev. Izkušnje dijakov pri pouku v času pandemije kažejo, da je bila količina snovi za učenje in delo zanje prevelika. Možno je, da se učenci sami zaradi pomanjkanja izkušenj s tovrstnim učenjem niso dobro organizirali, pa tudi da učitelji niso uskladili zahtev z zmožnostmi učencev.

Čeprav so tehnološke inovacije ustvarile različne priložnosti za učenje na daljavo (Amirault, 2015) je prehod iz znanega tradicionalnega učnega okolja "iz oči v oči" izziv tako za učitelje kot za učence zaradi kompleksne narave odprtih učnih virov (Chakraborty in Nafukho, 2014).

Prednost uporabe informacijskih tehnologij in orodij v času pandemije, torej ko so bile univerze zaprte, se je kazala v tem, da je študente naredila fleksibilne in jih pripravila na morebitno učenje v prihodnosti. Mladi so sprejeli koncept spletnega izobraževanja in upamo, da ga bodo uporabljali tudi v prihodnje.

Čeprav živimo v informacijski dobi, učitelji in učenci iz digitalno nerazvitih držav nimajo osnovnih znanj o možnostih in uporabi digitalnih tehnologij in vsebin na najučinkovitejši način. Pandemija je sicer odprla vrata v svet digitalizacije, a za učinkovito izvajanje celotnega pedagoškega procesa bodo morale digitalno nerazvite države vsekakor vložiti tako materialne kot človeške vire, da bodo lahko zakorakale v novo dobo izobraževanja.

Koncept izobraževanja 4.0 v prvi vrsti pomeni učenje, ki se lahko odvija kadar koli in kjer koli in pri katerem učenci sami določajo, kako in kaj se naučijo. Razvoj sposobnosti, kot so samostojnost pri zbiranju, podajanju in interpretaciji določenih podatkov, samozavedanje in podobno, je bil pospešen ob pojavu pandemije covida-19. Lahko rečemo, da je nastopilo "novo obdobje v izobraževanju", ki je v digitalno nerazvitih državah "prisililo" šole in univerze, da hitro preidejo z osebnega učenja na učenje z uporabo digitalne tehnologije. Kriza, ki jo je povzročil covid-19, je bila pomemben katalizator, ki je spodbudil izobraževanje 4.0 prav zato, ker je takšna situacija zahtevala uporabo informacijskih tehnologij v pedagoškem procesu. Najpomembnejša posledica pa je, da so vsi akterji v izobraževalnem sistemu, od osnovnošolskega in srednješolskega izobraževanja do univerze, "morali" sprejeti in uporabljati digitalno tehnologijo. Na ta način je bilo zagotovljeno, da so vsi udeleženci vseh stopenj izobraževanja doživeli podobno digitalno izkušnjo, kar bo v prihodnosti olajšalo prehod iz nižje na višjo stopnjo izobrazbe.

Gotovo je, da bo kriza v gospodarstvu, izobraževalnem in zdravstvenem sistemu, sistemu upravljanja, politiki, pa tudi načinu življenja svetovno skupnost vrnila nekaj let nazaj in da bo družbo v tej novi realnosti treba zgraditi na novo, a ni jasno, koliko časa bo trajalo, da se to zgodi. Ustvarjanje nove postpandemične družbe bo odvisno od številnih dejavnikov (politike, vedenja ljudi, tehnologije), a mnogi znanstveniki napovedujejo, da je osnova te "evolucije" izobraževanje in njegov razvoj.

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