UDC 330.3
МРНТИ 06.54.51

DOI: https://doi.org/10.37788/2021-3/44-51

S. Bespalyy[1]*, Ye. Ifutina[2]
[1,2]Innovative University of Eurasia, Pavlodar, Kazakhstan
*(e-mail: sergeybesp@mail.ru)

The education system in the era of the fourth industrial revolution: developing skills and thinking for learning

Abstract

Main problem: Computer systems and technologies are changing our society significantly. These changes are interconnected with both social and production spheres. Innovative digital technologies have a huge impact on the labor market and professional activity, contributing to their transfer to the electronic environment. Using digital technologies, modern people set new goals and solve problems with an increasing speed of problem solving, capitalizing on the possibilities of collaborative distributed actions within networks. In this regard, new competencies of specialists are in demand.

Purpose: The purpose of this study was to establish the impact of the fourth industrial revolution on the education system and the development of skills and thinking for learning.

Methods: When conducting scientific research, economic and statistical methods were used. These methods were also used in comparative analysis, as well as in assessing data and indicators of the higher education system, taking into account the impact of the fourth industrial revolution. The analytical method was used to consider the characteristics and factors influencing the development of skills and thinking for learning in modern conditions. The abstract-logical method is used to identify problems affecting the development of the labor market under the influence of digital technologies.

Results and their value: The result of the study is that conclusions are drawn about the upcoming changes. Automation and digitalization are likely to lead to significant unemployment in most countries, so adaptation innovation policies are needed to help offset unemployment due to digitalization. Governments need to invest heavily in higher education as an economic development tool for their citizens. Lifelong learning should be identified as a critical element of success in the era of the fourth industrial revolution. Curricula should develop digital skills and address workforce disruptions due to automation.

Key words: education system, automation, digitalization, fourth industrial revolution, skills, thinking for learning, labor market.

Introduction

Due to the improvement of digital tools and technologies, the labor market is changing dynamically. New industries are being formed and new types of professional activity are emerging. New specialties appear that could not have existed in the last century.

Demand for specialists in the field of processing and analyzing big data, computer modeling, neural networks, artificial intelligence, virtual reality, digital platforms and cybersecurity is expected to grow. In the near future, significant changes are expected in industry, medicine, the social sphere, the urban environment and the agricultural sector.

The relevance of concepts such as «smart city» and «Internet of Things» (IoT) is growing rapidly. In the agricultural sector, the digital economy presupposes the development of sustainable agriculture and precision animal husbandry based on GPS (Global Positioning System), GIS (Geographic Information Systems), yield monitoring technologies, variable rate technology, etc.; new materials; augmented reality; additive technologies; unmanned vehicles with artificial intelligence elements; advanced robotics; cloud computing and storage technologies; big data and machine learning; and many others - all of these phenomena have one thing in common: the ubiquity of ICTs. In turn, this causes the growth of highly productive jobs, the redistribution of human resources, new needs for vocational training and indicates the need for a significant improvement in the quality of education.

Therefore, in vocational training, the digital environment should be seen as a new complex environment for learning activities, professional activities and continuous professional development.

Materials and methods

The study focuses on the fourth industrial revolution, used statistical and economic and methods. Comparative analysis was used to assess information on the performance of the higher education system, taking into account the impact of the fourth industrial revolution.

When studying the features and factors affecting the development of skills and thinking for learning in modern conditions, the analytical method was applied. The study of the problems affecting the

development of the labor market under the influence of digital technologies made it possible to apply an abstract-logical method.

Results

In the digital economy, new classes of digital tasks are emerging for the predominant number of traditional jobs. The necessary competencies should be formed at different stages of training: in secondary vocational and senior, advanced training and retraining.

An important trend for all levels of education is the renewal of the digital educational environment and the growth of e-learning. The competence building process should be organized in a digital environment.

Rankings of the most popular ICT tools for learning are compiled annually (for example, the 200 best tools for learning). Learning Management Systems (LMS), Learning Content Management Systems (LCMS), e-learning platforms, digital libraries and repositories form the technological backbone for distance learning and e-learning technologies. In some cases, computer simulations, virtual labs, virtual reality systems, etc. are applicable to develop skills in an electronic environment. The practice of learning in social networks is investigated and the possibilities of Web 3.0 for learning are comprehended [1].

Remote access to digital resources makes it possible to expand the information field of education by taking advantage of digital portals, databases of publishing houses, scientific databases and digital knowledge databases. Knowledge competition is intensifying as universities and research organizations contribute to the global information environment. Universities are ranked according to the presence of open resources on the Internet (publications, citations, impact factor, etc.)

Thus, vocational training in the digital environment is carried out using new resources, tools and technologies and, therefore, requires new methods and pedagogical practices to form new competencies.

Not only technological innovations are important, but also profound psychological changes in the training process. In the conditions of technological modernization, the formation of a digital economy, uncertainty and dynamics of the labor market, teachers are forced to make students responsible for active self-improvement. It is especially important to support initiative, creativity and self-realization in learning, as well as taking into account personal requirements and learning strategies [2].

The leading part of students should be focused on breakthrough, in-depth study of new approaches to learning and solving professional problems.

The high potential of an enriched and expanded digital environment opens up access to unlimited resources in the native and foreign languages, the achievements of science and culture. Advanced technologies require new personal qualities in educational and professional activities. The goals of mastering new computer methods of cognition are becoming a priority. The learner's ability to choose the information, techniques and teaching methods needed contributes to a new personal semantic reality and opens up new ways to learn and learn new skills. The free choice of educational activity is of particular importance.

The teacher must understand the variety of advanced learning opportunities provided to the student. The personal learning environment and curriculum become the subject of joint teacher and student analysis. The implementation of non-linear educational practices and learning strategies in the digital space allows you to realize your personal potential in the context of professional interests and life plans. The center of professional training should be the student as an active student, as a person of potential professional activity in the digital environment.

In recent years, the situation and attitude towards ICT in education has changed significantly. A significant contribution to the changes was made not only by an increase in the status of ICT equipment for educational institutions and students, but also by new target areas of study. Analyzing pedagogical activity from the point of view of the degree of penetration of digital technologies, it is important to identify not only quantitative characteristics, but also their influence on conditions and learning outcomes, on changing the content of learning and teaching methods that ensure the formation of professional competence [3].

The means of the digital environment allow you to set educational tasks in a new way and create innovative conditions for the formation of students' readiness:

– to act within the framework of corporate information systems, cloud offices, which are attributes of professional activity in any area;

– independently engage in professional self-development in an open information environment;

– effectively interact with partners in the framework of remote collaboration;

– strive to innovate and master new means and situations in professional activity.

The global society is changing due to shifts in technological potential. Higher education must change with it. Many current jobs can be automated.

Automation is the result of technological advances fueled by advances in big data, cloud computing, and machine learning. Indeed, the ongoing processes are changing the meaning of being a human. The way we work and live is changing because nowadays we have access to vast amounts of data that can tell us something new and allow machines to do new things. There will be new jobs, but it is also true that a future awaits us in which there can be economic growth without job growth.

Driving trucks, cars or lawn mowers is no longer a human business. This has serious implications for economies around the world. In the past, manufacturing relied on machines to make basic human labor more productive. We are faced with a future in which people may no longer be needed for production. People

remain an integral part of Industry 4.0; their creativity and ideas drive change. People will work together with robots, and together they will empower [4].

Traditional higher education through the transmission of information is no longer a viable form of education for employment and careers. In this context, we must ask how do we prepare able-bodied and responsible citizens in our higher education systems? Michael Peters argues that education alone will not be enough to tackle technological unemployment. Others stress the importance of a liberal arts education as an ideal solution for preparing future-ready graduates.

Education in traditional tertiary institutions is still important, but their collaboration with industry and the public sector should be much more intense. Of course, universities still need freedom in their research, and many do not want their research program and curriculum to be dictated to them, but big collaboration is always a good thing. Financing of industry and the state through state grants, programs for improving the qualifications of the population is also important [5].

What makes us human, our emotional intelligence and our creativity, will be in demand when this transition to automation is complete, experts say. Responsive, flexible minds will be most in demand in the future, as they will have the cognitive flexibility to keep up with rapidly changing jobs. The Accenture report explains that the main trend in Industry 4.0 is a so-called liquid workforce that is not ready to abandon old work models that were tied to specific business functions. Instead, future work will be based on an adaptive workforce organized around projects, supported by embedded learning. This new type of employee needs to prepare a different education.

Erik Brynjolfsson and Andrew McAfee argue that for people to remain «valuable knowledge workers» they must «work to improve their thinking skills, big-frame image recognition, and complex communication». Not everyone in the world can be a skilled worker in this context. The creative destruction of jobs will be devastating, but new jobs will come in their place. As Joseph Aoun pointed out in his book, it is very important to think about creative ways of working, and universities are «ideal entrepreneurial ecosystems» [6].

Much research has been done to understand how people learn and how best to teach them to think creatively. Students from different cultures and different ages learn in different ways. Moreover, how educators themselves understand the concepts of problem solving, critical thinking, and creativity is discipline dependent and subjectively implemented. Evidence shows that learners learn more and remember better when Problem-Based Learning is the way to learn. Problem-Based Learning is student-centered. A key feature is that students work in groups to solve open-ended problems. In particular, project-based learning demonstrates that it makes students more motivated and facilitates more effective interaction with discipline content. This is the engagement that educators should strive to generate in their students. The large lecture hall with one professor, where information flows from the instructor to the 50–100 students in the classroom, is an outdated approach to student education. This pedagogy does not provide the skills required for the automation economics, since rote memorization is not a skill required in the era of Industry 4.0: machines will do this part of the work for us. Such knowledge is not devoid of value, but the content that is intended to be delivered is only one piece of the puzzle of effective and good work. Students need to learn new ways of working with content over and over again. Problem-based learning and experiential learning are important components of higher education pedagogy in the Industry 4.0 era. Brinjolfsson and McAfee highlight the value of these self-organizing learning environments, which are well suited to what they call the second machine age, and more broadly as Industry 4.0 and its employment requirements. To reap the benefits of Industry 4.0, students need the thinking habits that such pedagogical approaches provide.

The level of development of digital skills. Within the framework of the Program for International Assessment of Adult Competencies (PIAAC) developed by the OECD Directorate for Education from 2011–2012. adult skills research is being carried out. The 2019 PIAAC research notes that the level of development of the skill of solving problems using digital devices is directly related to the risk of unemployment. The most protected from this point of view are employees who can confidently solve professional problems in a technologically rich environment [7].

Since 2014, The Digital Economy and Society Index (DESI) has been published by the European Commission.

DESI assesses five main areas of digitalization:

– access level: type and cost of access to fixed, mobile, regular, fast and ultra-fast broadband networks;

– human capital: basic level of Internet skills, advanced level and their development;

– distribution of Internet services: the level of use by citizens of Internet content, Internet communications and Internet transactions;

– integration of digital technologies: digitalization of business processes and development of e-commerce;

– digitalization of social services: e-government and digitalization of the healthcare system.

According to 2018 data, the European leaders are the Scandinavian countries – Denmark, Sweden, Finland – and the Netherlands. The results show that the penetration of Internet services has increased in the EU due to an increase in the number of graduates in specialties related to science, technology, engineering

and mathematics (STEM). While in 2013 only 18.4 out of 1000 people aged 20-29 received higher education in STEM, in 2015 this level rose to 19.1. In addition, in three years, the number of ICT professionals in the EU has grown from 7.3 million to 8.2 million in 2016. In 2018, the European Commission calculated the International DESI Index for the second time.

At the same time, in the post-Soviet space, according to these indicators, Russia and Kazakhstan are the best countries, Kazakhstan lags slightly behind, but, in general, it confidently demonstrates the growth of digitalization of public life in recent years. So the e-government portal E-gov was put into operation and improved, as well as the DamuMed portal was opened for the convenience of residents, where citizens of the country can make an appointment with a doctor without long queues at the registry. And also it became possible to get the test results directly in the mobile application. All these innovations demonstrate the desire of the Republic of Kazakhstan to develop the digitalization direction in order to be among the leading countries of the world in this indicator in the future.

Digital data and automation as the driving force behind the global economy in the future. Automation poses a threat to both low-skilled and medium-skilled professionals – office workers, builders, machine tool operators. The «Auto's Curve» shows the change in employment in US industries from 1980 to 2005, depending on the qualifications of workers. According to the curve, due to technological development, employment is growing among low- and highly-skilled workers, while it is decreasing among workers with average qualifications. Low-skilled personnel is still expensive to automate, and highly qualified personnel is still difficult due to the complexity of the tasks being solved. This is confirmed by the report of the Organization for Economic Cooperation and Development. In OECD countries, the share of semi-skilled workers declined from 49 % to 40 % over the period 1995–2015. For comparison: the share of employees with high and low qualifications for the same period increased by 7.6% and 1.9%, respectively [8].

With the growth of automation, the demand for the creation of new sectors will skyrocket, and there are at least four areas where significant changes can occur (Figure 1):

– the technology sector as a result of the development of next generation technologies for industrial and consumer applications;

– human-centered services that will affect areas not subject to automation – personalized services in education, healthcare, experience design, entertainment, etc.;

– virtual economy – spheres of activity located in various virtual environments;

– creative economy aimed at creating something new as a result of a creative process based on new technologies.

The level of automation with the ratio of working hours is shown in Figure 1.

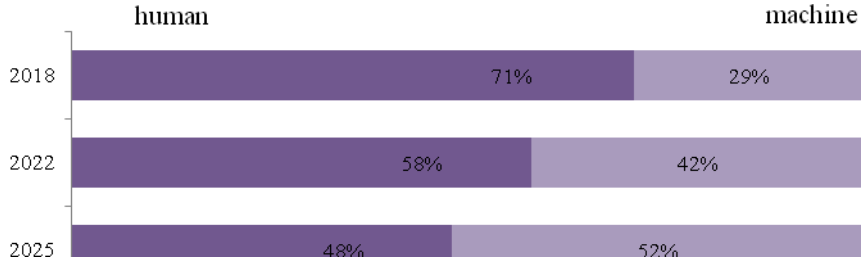

Figure 1 – Level of automation, ratio of working hours (%)

Currently, 29 % of world production is automated. For comparison, in 2022 the share of machines and algorithms in working hours will already be 42 %, in 2025 – 52 %. Less than a quarter of workplaces can be automated by 70 % or more.

The International Federation of Robotics (IFR) estimates that one robot per million hours worked increases productivity by 0.04 %. Operational cost savings from automation in general can range from 15 % to 90 % depending on the industry. The efficiency and usability of robots will lead to their ubiquity. BCG estimates the robotics market will reach US $ 87 billion by 2025, with nearly a third of the market going to be for commercial use.

If we consider individual market sectors, then, according to experts, the industry is considered the most vulnerable to robotization in the hotel and restaurant business – about 75 % of the processes there can be automated. In second place is the extraction of minerals – 63 % of the processes. In production, a low level of automation is predicted (no more than 30 % of all processes), primarily due to the already existing high level of automation and the high cost of introducing new robots. In the financial sector, it is possible to automate 37 % of all work.

Learning in the digital age will be continuous, social, personalized, focused on the needs and interests of the learner, and educational decisions will be made on the basis of big data collected during previous training sessions. This means a significant change in the educational paradigm. This change is not only about the

digitalization of learning processes. Technological advances in the information environment are expanding learning opportunities by combining traditional teaching methods with modern technology.

Accelerating technological change poses major challenges for global digital skills education. These challenges include a number of areas, the work on which requires immediate joint action on the part of educational institutions, the business environment and governments:

1) The growing shortage of specialists with complex digital skills. When any substantially new technology emerges, workers and users need new skills to be able to use it effectively and sustain potential productivity gains.

2) Formation of digital competence models for people of different age groups and professional communities. Efforts by corporate structures and digital skills workers continue to lag consistently in terms of adequate institutional and regulatory support.

3) Increasing demand for digital skills in the professional environment. According to IBM's survey of 5,600 global executives on skills development, half of the respondents believe that companies themselves are responsible for developing the necessary skills in workers, and only 39 % of respondents believe that employees themselves should develop and maintain their professional skills.

4) Formation of a system of motivation for increasing digital literacy and lifelong learning. An important group of challenges in digital skills training is associated with low motivation of workers to master specific digital skills in the context of a complex combination of technological and communication skills. It is important to undertake efforts to develop monetary and non-monetary incentive programs for learning.

5) The optimal combination of standard educational approaches with new technologies applicable in teaching. The key vector in the development of educational technologies is determined by the need to supplement the existing formats of educational products for teaching digital skills with new approaches based on mobile learning and the use of artificial intelligence.

6) Evaluating the cost and effectiveness of impact on digital skills training. It is necessary to create methodologies for assessing skills at the individual level. Instead of traditional testing «at the entrance» and «at the exit» there is a need for multiple slices of student behavior in connection with the different temporal dynamics of digital learning systems.

Discussion

One of the proposals for Kazakhstan may be the SkillsFuture initiative – these are the skills of the future – an initiative aimed at advanced training of personnel in the professions of the future, already in the short term a challenge for education and industry in Kazakhstan. The goal is to provide Kazakhstanis with the opportunity to fully reveal their potential throughout their lives. Through this movement, the skills, enthusiasm and contribution of each individual will contribute to the next stage in Kazakhstan's development towards a developed economy and an inclusive society. Mastery of skills is more than qualifications and good university grades; it is a mindset based on the constant pursuit of excellence through knowledge, application and experience.

SkillsFuture is a government initiative designed to help adjust your mindset and capabilities for the automation economy.

The SkillsFuture initiative is based on four key pillars.

First, it is designed to help people make decisions about their education, training, and how this might fit into their careers.

Second, SkillsFuture operates an integrated, high-quality education and training system that responds to changes in Industry 4.0 technology and related industry jobs.

Third, the initiative is working with industry to ensure that the employer recognizes certificates of continuing education and promotes / compensates for skill acquisition accordingly. Fourth, SkillsFuture works to develop a culture that supports and encourages lifelong learning.

Exploring Singapore's SkillsFuture experience, five levels of support can be distinguished: student, junior, mid-level management, senior management, and career choice specialist. There are many opportunities in Singapore, particularly for adult learners. For many in Singapore, continuing education is expensive. There are three different funding mechanisms for this. SkillsFuture Credits are available for all Singaporean citizens, so they do not need to have the funds to upgrade their qualifications. There are also SkillsFuture qualifying awards and student awards, and the Earn and Learn program. SkillsFuture works with higher education institutions, but also supports the Institute for Lifelong Learning, where Singaporeans of all levels can take targeted courses to acquire new skills.

SkillsFuture's intent is to make labor disruptions less socially and economically alarming as a result. In addition, workers will be better prepared for an automation economy that benefits themselves and the country's economy.

Digital competencies. Modern digital technologies are a catalyst for the transformation of the world. Digital transformation is having a huge impact on business and social life, opening up ways to generate economic and social benefits. The Digital Economy (DE) theme supports research to quickly understand the transformative impact of digital technology on aspects of social life, cultural experience, the future of society and the economy. DE brings together a unique community of researchers from a variety of disciplines including social sciences, engineering, computer science, arts, and medical research.

Most European countries have approved development strategies until 2020. The Digital Agenda, presented by the European Commission, refers to seven major strategies and proposes to make wide use of the potential of information and communication technologies (ICTs) to foster innovation, economic growth and progress. The digital agenda should help maximize the use of digital technologies, since the availability of skilled workers is critical to creating a digital society and ensuring the competitiveness of individual countries and their citizens.

A number of studies are devoted to the problem of reducing the gaps in the understanding of digital competencies by different categories of people. The EU recommendations on monitoring the digital economy and society for 2016–2021. proposes indicators to measure digital skills. The introduction of digital technologies affects many areas and aspects of society, thus, for example, transforming opportunities for employment, education, leisure, attraction and participation in society. Digital competence, as the confident use of information and communication technology (ICT) tools, is vital for human participation in today's socio-economic life. This is why digital literacy (or digital competence) is recognized by the EU as one of the eight core competencies for fulfilling life and work. In this regard, the problem of improving (transforming) the education system as a social institution of human development for the training of competent specialists, taking into account the needs of the market and modern trends in the development of digital technologies, is actualized.

There are several frameworks for determining the level of digital competence. Among them are the European System of Electronic Competencies for ICT Professionals, European Computer Driving License, ICT Competences, Global Media and Information Literacy Assessment System, European Digital Competence System -DigComp, which provides a common approach to defining and describing the main areas of digital the competence of people and is a common mark at the European level. DigComp has three main areas: (1) policy formation and support; (2) planning training and employment programs; (3) assessment and certification.

In Kazakhstan, digital competencies are necessary for people to succeed in the digital economy. The results of the survey, in which the students and teachers of the Toraighyrov University and the Innovative University of Eurasia of the Pavlodar region took part, allow us to conclude:

1) Teachers and students have a level of use of digital tools and communications. However, the level of competence does not depend on how the skills were acquired.

2) The level of competence of professional use of IT among students is much higher than that of teachers. Teachers have a higher level of IT use for educational tasks.

3) Factors affecting performance depend on digital competencies.

A sufficient level of digital competencies of both students and teachers testifies to their readiness to implement digital learning.

Conclusion

Digital competencies affect the structure of study programs, the professional development of teachers, and the services and resources dedicated to students at the university. Therefore, the university should create a unified environment for managing digital competencies. This allows the university to provide: a unified information space for the management, development and transfer of digital competencies; communication between students, teachers and university administration is optimized; individual planning, monitoring and management of the educational trajectory individually for each student.

THE LIST OF SOURCES

1 Балтабаева А. К. Глобальные тренды цифровизации и международный опыт. / А.К. Балтабаева // Молодой ученый. – 2019. – №15. – С. 16-17.

2 Watanabe, K., Tou, Y., Neuttaanmäki, P. (2018). A new paradox of the digital economy - structural sources of limiting GDP statistics. Journal of Technological Sociology. Vol. 55, 9-23.

3 Richardson, L., Bissell, D. (2019). Geography of Digital Skills. Geoforum. Vol. 99, 278-286.

4 Colombo, E., Mercorio, F., Mezzanzanica, M. (2019). AI Meets the Labor Market: Exploring the Relationship Between Automation and Skills. Journal of Information and Economic Policy. – Vol. 47, 27-37.

5 Kurt, R. (2019). Industry 4.0 in terms of industrial relations and its impact on working life. Procedures Comput. Sci. Vol. 158, 590-601.

6 James, T., Miller, J. (2005). Monitoring and Evaluation of ICT in Educational Projects. infoDev, World Bank, Washington DC.

7 Deborah, G. (2017). ILO Policy, ILO, Geneva.

8 Рахимова С.А., Беспалый С.В. и др. Цифровая экономика и ее влияние на индустриально-инновационное развитие: коллективная монография. – Алматы: Изд. дом «МИР», 2020. – 260 с.

REFERENCE

1 Baltabaeva, A.K. (2019). Global'nye trendy cifrovizacii i mezhdunarodnyj opyt. [Global digitalization trends and international experience] Scientific journal «Young Scientist», 15, 16-17 [in Russian].

2 Watanabe, K., Tou, Y., Neuttaanmäki, P. (2018). A new paradox of the digital economy - structural sources of limiting GDP statistics. Journal of Technological Sociology.
3 Richardson, L., Bissell, D. (2019). Geography of Digital Skills. Geoforum.
4 Colombo, E., Mercorio, F., Mezzanzanica, M. (2019). AI Meets the Labor Market: Exploring the Relationship Between Automation and Skills. Journal of Information and Economic Policy.
5 Kurt, R. (2019). Industry 4.0 in terms of industrial relations and its impact on working life. Procedures Comput. Sci.
6 James, T., Miller, J. (2005). Monitoring and Evaluation of ICT in Educational Projects. infoDev, World Bank, Washington DC.
7 Deborah, G. (2017). ILO Policy, ILO, Geneva.
8 Rahimova, S.A., Bespalyy, S.V. i dr. (2020). Cifrovaya ekonomika i ee vliyanie na industrial'no-innovacionnoe razvitie: kollektivnaya monografiya. [Digital economy and its impact on industrial and innovative development: collective monograph] – Almaty: Izd. dom «MIR» [in Russian].

С.В. Беспалый[1], Е.А. Ифутина[2]
[1,2]Инновациялық Еуразия университеті, Қазақстан

Төртінші өнеркәсіптік революция дәуіріндегі білім беру жүйесі: оқу дағдылары мен ойлауды дамыту

Компьютерлік жүйелер мен технологиялар біздің қоғамды айтарлықтай өзгертеді. Бұл өзгерістер әлеуметтік саламен де, өндірістік саламен де байланысты. Инновациялық цифрлық технологиялар еңбек нарығына және кәсіби қызметке үлкен әсері бар, олардың электронды ортаға ауысуына да ықпал етеді. Цифрлық технологияларды қолдана отырып, қазіргі адамдар жаңа мақсаттар қояды және мәселелерді шешудің жылдамдығымен шешеді, бұл желілерде бірлескен таратылған әрекеттердің мүмкіндіктерін пайдаланады. Бұл контексте – мамандардың жаңа құзыреттіліктері сұранысқа ие.

Бұл зерттеудің мақсаты – төртінші өнеркәсіптік революцияның білім беру жүйесіне әсерін анықтау және оқу үшін дағдылар мен ойлауды дамыту.

Ғылыми зерттеулер жүргізген кезде экономикалық және статистикалық әдістер қолданылды. Бұл әдістер салыстырмалы талдауда, сондай -ақ төртінші өнеркәсіптік революцияның әсерін ескере отырып, жоғары білім беру жүйесінің деректері мен көрсеткіштерін бағалауда қолданылды. Аналитикалық әдіс қазіргі жағдайда оқыту дағдылары мен ойлауының дамуына әсер ететін сипаттамаларды және факторларды қарастыру үшін қолданылды. Абстрактілі-логикалық әдіс цифрлық технологиялардың ықпалынан еңбек нарығының дамуына әсер ететін мәселелерді анықтау үшін қолданылады.

Зерттеу нәтижесі – алдағы өзгерістер туралы қорытынды жасалады. Автоматтандыру мен цифрландыру көптеген елдерде айтарлықтай жұмыссыздыққа әкелуі ықтимал, сондықтан цифрландыруға байланысты жұмыссыздықтың орнын толтыру үшін бейімделу инновациялық саясаты қажет. Үкімет өз азаматтарының экономикалық даму құралы ретінде жоғары білімге қомақты қаржы бөлуі қажет. Өмір бойы білім алуды төртінші өнеркәсіптік революция дәуіріндегі табыстың маңызды элементі ретінде анықтау қажет. Оқу бағдарламалары цифрлық дағдыларды дамытуы және автоматтандыруға байланысты жұмыс күшінің бұзылуын шешуі керек.

Түйінді сөздер: білім беру жүйесі, автоматтандыру, цифрландыру, төртінші өнеркәсіптік революция, дағдылар, оқу үшін ойлау, еңбек нарығы.

С.В. Беспалый[1], Е.А. Ифутина[2]
[1,2]Инновационный Евразийский университет, Казахстан

Система образования в эпоху четвертой промышленной революции: развитие навыков и мышления для обучения

Компьютерные системы и технологии существенно меняют наше общество. Эти изменения взаимосвязаны как с социальной, так и с производственной сферами. Инновационные цифровые технологии оказывают огромное влияние на рынок труда и профессиональную деятельность, способствуя их переносу в электронную среду. Используя цифровые технологии, современные люди ставят новые цели и решают задачи, извлекают выгоду из совместных действий внутри сетей. В контексте этого востребованы новые компетенции специалистов.

Целью проведенного исследования являлось установление влияния четвертой промышленной революции на систему образования и развитие навыков и мышления для обучения.

При проведении научного исследования использовались экономические и статистические методы. Данные методы использовались и при проведении сравнительного анализа, оценке данных и показателей системы высшего образования с учетом влияния четвертой промышленной революции. Аналитический метод использовался при рассмотрении особенностей и факторов, влияющих на развитие навыков и мышления для обучения в современных условиях. Абстрактно-логический метод

использовался при выявлении проблем, влияющих на развитие рынка труда под воздействием цифровых технологий.

В результате исследования сделаны выводы о наступающих переменах. Автоматизация и цифровизация, скорее всего, приведет к значительной безработице в большинстве стран, поэтому необходима адаптационная инновационная политика, которая поможет компенсировать безработицу в связи с цифровизацией. Правительству необходимо вкладывать значительные средства в высшее образование как инструмент экономического развития, которым могут пользоваться его граждане. Непрерывное обучение должно быть определено как важнейший элемент успеха в эпоху четвертой промышленной революции. Учебные программы должны развивать цифровые навыки и быть направленны на устранение сбоев в рабочей силе из-за автоматизации.

Ключевые слова: система образования, автоматизация, цифровизация, четвертая промышленная революция, навыки, мышление для обучения, рынок труда.

Date of receipt of the manuscript to the editor: 2021/08/22