

Staff training in terms of digital economy development: the experience of Polotsk State University (Republic of Belarus)

Alena Barun

*Department of Physical Training and Sports
Polotsk State University
Novopolotsk, Belarus*

Natallia Dauhiala

*Department of Technology and Methods of
Teaching
Polotsk State University
Novopolotsk, Belarus
nata20088002@yandex.by*

Dzmitry Dauhiala

*Department of Power Engineering and
Electronics
Polotsk State University
Novopolotsk, Belarus*

Abstract—The article examines the features of the educational process in conditions of digital transformation of economy, as well as key competencies and skills that required in the digital economy. The main trends in the sphere of education are described. The experience of the Polotsk State University countries in the field of digital transformation of education is presented.

Keywords—*digital economy; digital transformation of education; higher education, digital competence, staff.*

I. INTRODUCTION

Introduced in the mid-90s of the last century, the concept of the digital economy has become firmly established in our lives. The digital economy implies not just the use of the Internet as a tool to increase the efficiency of previous business processes, but the formation of qualitatively new principles of organization of separate business, economy, and then society as a whole, the transformation, including social relations through the transformation of the social and labour sphere [1]. According to the statistics, in the period from 2009 to 2011, the digitalization created 17 million jobs in the countries with transition economies. [2]

The importance of the development of the information society and the digital economy in the Republic of Belarus was originally identified in the Strategy for the Development of the Information Society in the Republic of Belarus for the period up to 2015, approved by the Resolution of the Council of Ministers of the Republic of Belarus of 09.08.2010 No. 1174. A natural continuation of this Strategy is the State Program for the Development of the Digital Economy and Information Society for 2016-2020, approved on March 23, 2016 by the Resolution of the Council of Ministers of the Republic of Belarus No. 235, Informatization Development Strategy in the Republic of Belarus for 2016-2022, approved at the meeting of the Presidium of the Council of Ministers of 03.11.2015 No. 26, as well as the decree No.8 "About the development of the digital economy", signed by the President of the Republic of Belarus on December 21, 2017, is in the same row, which radically improves the conditions for the development of the IT industry and creates prerequisites for the formation of competitive advantages of Belarus as an IT country and for the accelerated development of the digital economy. [3; 4]

The development of the digital economy, based on the production, distribution and consumption of information, causes major socio-economic changes, including education, as the basis of the digital economy is highly qualified staff. Universities play a key role in this process as they form productive human capital — the main driving force of economic development. Every day the need for IT-specialists increases. Some recruitment companies have estimated that the number of employees in this sphere is constrained by the limited capacity of a higher education institution. [5].

II. METHODS

Staff training under conditions of the development of the digital economy is analyzed on the example of Polotsk State University (the Republic of Belarus)

The methodological basis of the study is:

- a systematic approach allows to consider the university model of staff training as a system of required interrelated elements in a multi-level structure, which is focused on staff training;
- comparative historical approach allows to show the development of the education system in the context of more general processes, occurring in the country;

The main research methods were analysis and synthesis. The conceptual and terminological analysis of the literature was used to describe the categorical field of the problem; the materials and the results of the educational activities at the educational establishment are also analyzed.

The transition to the information society radically changes the requirements for those competencies that students acquire during training. The special report of the World Economic Forum has emphasized the importance of "21st century skills," which include the ability of critical thinking and problem solving, the capacity to develop argumentation, to analyze and synthesize information. An important place among the qualities necessary for a modern employee is occupied by "information and communication competence, media and Internet literacy, qualified assessment and analysis of information and data, and computer programming". The high level of development of these skills can guarantee successful life and work in an

information society. [6, c.105]. Extremely high rates of development of digital technologies, their active introduction into curricula and everyday life give a competitive advantage to young people —this age category of the population is in the stage of active accumulation of human capital and is able to react flexibly to changes around the world. Therefore, the link of adaptability to the digital economy and age is most evident. [7]

The increased use of information and communication technologies (ICT) and the Internet environment directly at the workplace in any organization is causing growing demand for digital literacy and new digital skills.

Digital literacy refers to a set of knowledge and skills that are necessary for the safe and effective use of digital technologies and Internet resources. [8]

Digital skills mean a set of skills to use digital devices, messaging applications and networks for searching and managing information, creating and distributing digital content, interaction and collaboration, as well as solving problems in the context of effective and creative self-realization, learning, work and social activity in general. According to the classification adopted in Canada, digital skills cover several categories: 1. Fundamental skills, including basic literacy, writing, use of documents and accounts, without which only low-skilled work can be successfully completed. 2. Transversal skills that include mainly transferable and flexible skills, such as teamwork, lifelong learning, problem solving and relationship development. Without these soft skills, the technical capacity of an employee cannot be fully realized. 3. Digital technical skills relate to the use of a computer and software, the application of network security measures and others. These skills are crucial for the effective functioning of modern jobs with digital technology. 4. Digital information processing skills are high-level cognitive skills in relation to information processing, such as search, synthesis, evaluation, application, creation and transmission of information. [9]

Thus, nowadays, when implementing the strategy for the development of the digital economy of the Republic of Belarus, ICT education should cover all groups of the population and form their basic and professional additional competences.

III. RESULTS

Polotsk State University is a major educational, scientific and cultural center of the Northern region of the Republic of Belarus. The University aims to integrate educational, scientific and innovative activities with the needs of the real economy and social sphere as much as possible. Due to the growing clustering in the Polotsk-Novopolotsk region, the University is training specialists for the ICT sector and the digital economy. At Polotsk State University the Faculty of Information Technologies, the Faculty of Mechanics and Technology and the Radio Engineering Faculty are degree-granting in the following bachelor specialties [10]: Finally, complete content and organizational editing before formatting. Please take note of the following items when proofreading spelling and grammar:

TABLE I. TRAINING SPECIALISTS FOR THE ICT SECTOR AND THE DIGITAL ECONOMY

Specialty	Training specialists for the ICT sector and the digital economy			
	Qualification	Description of a specialty	Year of introduction	Enrollment numbers for 2019
1-28 01 02 Electronic Marketing	Marketer-program	comprehensive training in dealing with the establishment and development of long term economically profitable relations between the commercial organizations and their customers using information and communication technologies and systems, including website promotion, using contextual and banner advertising, social media and media marketing, electronic PR, content management, marketing via mobile apps and web analytics.	2019	40
1-40 02 01 Computer, Systems and Networks	Software engineer	comprehensive training in the aspect-oriented software development, computer networks and software and hardware appliance.	1996:	22
1-40 01 01 Computer Systems and the Internet Technologies	Part-programming engineer	comprehensive training in the theoretical foundations and practical skills of development, verification and maintenance of software systems using programming languages (C, C++, C#, F#, Java, Python, Ruby); software development and testing technologies, software platforms (.NET, Java); web technologies, mobile technologies, operating	2008	80

Specialty	Training specialists for the ICT sector and the digital economy			
	Qualification	Description of a specialty	Year of introduction	Enrollment numbers for 2019
		systems (Windows, Linux, Mac OS X, iOS, Android)		
1-39 03 02 Programma ble Mobile Systems	Electronic systems engineer	comprehensive training in programming the hardware of mobile devices and developing software for embedded mobile systems based on Android, iOS, Linux, FreeRTOS, eCOS, WindowsPhone.	2019	25
1-56 02 02- 01 Geoinforma tion Systems (land cadastral)	Specialist in cadastral and geographic information systems engineer	comprehensive training on the creation and updating of computer data banks and electronic maps for various purposes, including land and cadastral, environmental and others	2010	-
1-98 01 01 01 Computer security (mathematical methods and software systems)	Specialist in information security. Mathematician	comprehensive training in a range of programs, hardware and the means of information security while processing, storage, and transmission with the usage of modern technologies.	2009	20
1-39 02 02 Design and Production of Software- Controlled Electronic Devices	Engineer,Electronics Engineer,and Programmer.	comprehensive training connected with the design, development and manufacture of any electronic device, including programmable ones. Among such electronic devices are computers, video systems, smartphones, satellite navigation systems, power and control units and other devices,which havemicrocontrollers, semiconductor	2015	20

Specialty	Training specialists for the ICT sector and the digital economy			
	Qualification	Description of a specialty	Year of introduction	Enrollment numbers for 2019
		devices and related firmware at its core.		
1-36 07 02 3D Manufacturing	Engineer	comprehensive training on introduction to design of prototypes and models of products, industrial design, computer simulation techniques, 3D manufacturing technologies, programming and automatization of 3D technologies and technological equipment means.	2017	20

For non-core specialties the disciplines such as “Basics of Information Technologies”, “Information Technologies in Education”, “Information Technologies in Management”, “Computer Graphics and Multimedia” are taught. They form the basic ICT competencies required by a wide range of professions.

Within the life-long learning education, the Institute of Professional Development at Polotsk State University implements the following programs of staff retraining and educational courses in the ICT sphere [11]:

1. The retraining program in the specialty "Information Systems Software" (with the qualification of a software engineer) includes the study of various programming languages and application development environments to create adapted software to optimize the enterprise to minimize time and labour costs, and, consequently, increase its competitiveness.

2. The program of staff retraining “AutodeskRevit - the basis of BIM-modeling of buildings. Basic course (2 weeks of study) provides for studying the basics of BIM design, the structure and features of a project in Autodesk REVIT program, the fundamentals of developing REVIT families.

3. Educational courses:

- Preparatory online courses for applicants entering the reduced form of training in the specialty 1-40 01 01 "Information Technology Software" (54 academic hours)
- MicrosoftExcel (20 academic hours)
- Basics of computer literacy (16 academic hours)
- Software Testing (20 academic hours)

- Programming in Linux (20 academic hours)
- Basics of MicrosoftWord (8 academic hours)
- C programming (10 academic hours)

In 2019, it is planned to conduct courses in relevant up-to-date areas:

- Advanced user
- Building SMM strategies and SMM promotion as an effective Internet marketing tool
- Basics of working with application software packages for engineering and physical modeling
- Web Design for Beginners
- Study of the programs AutoCAD, MS Excel, MS Word
- Basics of Internet technology, web programming and web design
- Microsoft Excel
- The Basics of ARDUINO Programming for non-programmers
- Basics of C programming
- Basics of programming logic controllers and elements of industrial automation
- Computer-aided design of indoor, outdoor, architectural and landscape lighting
- Training of students in the perspective direction of engineering systems design: Building Information Modeling (BIM)
- Modeling and calculation of technological equipment and units of technological installations with the help of modern software [12-14]

Moreover, a number of training courses are organized in the system of additional education of children. Thus, the Center for Preschool Childhood and Innovation Developmental techniques "UNIVERik" of Polotsk State University is implementing a program with school children based on the educational system STEM. Within STEM-education 3 directions are offered to children from 5 to 12 years:

1. Entertaining robotics. (designing robots, and then programming them to perform various actions).
2. Technology and physics (introduction to the basics of mathematics, physics and technology and special technical disciplines).
3. Entertaining electronics (learning the basics of electric engineering)[15].

Since July 9, 2018 in the frame of STEM-education summer vocational school "STEM-technology - the way to success" was held. The target audience was school students of the 9th grade. The school program included classes with experienced teachers (Mathematics, Physics and Electrophysics, Engineering) in university laboratories and career-guidance visits to the faculties (Radio Engineering

Faculty, Faculty of Humanities, Faculty of Information Technologies, Faculty of Mechanics and Technology, Faculty of Civil Engineering), as well as various types of psychological games, workshops about different professions, about modern labour market and design of professional life[16].

IV. CONCLUSION

Thus, the training of field specialists for the ICT is an important requirement for the formation and further development of digital economy in the Republic of Belarus. Educational programs that provide knowledge and practical skills, which are necessary in order to use the latest ICT in professional activities are implemented in the education system at PSU. All necessary the conditions for the development of the required skills and competencies in specialists for the digital economy are created. There is a possibility of additional ICT education for all groups of population in order to form the basic and professional competencies for the strategy realization that will help to develop digital economy in the Republic of Belarus.

REFERENCES

- [1] E. Sadovaya Digital economy and a new paradigm of the labor market. (World Economy and International Relations, 2018, vol. 62, no. 12, pp. 35-45)
- [2] R. Bukht, R. Heeks Defining, Conceptualising and Measuring the Digital Economy // International Organisations Research Journal, 2018, vol. 13, no 2, pp. 143-172 (in English).
- [3] Strategy of Informatization development in the Republic of Belarus for 2016-2022. Approved at the meeting of the Presidium of the Council of Ministers from 03.11.2015 № 26. Available at: e-gov.by/zakony-i-dokumenty/strategiya-razvitiya-informatizacii-v-respublike-belarus-na-2016-2022-gody (accessed 7 April 2019).
- [4] L. Arkhipova Training of Specialists in the Field of Electronic Marketing: Staff for the Digital Economy of the Republic of Belarus // Digital transformation, 2017, no. 1, pp. 38 - 44.
- [5] M. Cervantes Higher Education Institutions in the Knowledge Triangle. Foresight and STI Governance, 2017, vol. 11, no 2, pp. 27-42. DOI: 10.17323/2500-2597.2017.2.27.42
- [6] S. Avdeeva Assessing Information and Communication Technology Competence of Students: Approaches, Tools, Validity and Reliability of Results. Educational Studies Moscow. 2017, no. 4, pp. 104-132
- [7] M. Baskakova, I. Soboleva New Dimensions of Functional Illiteracy in the Digital Economy. Educational Studies Moscow. 2019, no. 1, pp. 224-263
- [8] E.V. Vasilieva, V.N. Pulyaeva, V.A. Yudina Digital competence development of state civil servants in the Russian Federation. Business Informatics, 2018, no. 4 (46), pp. 28-42.
- [9] G.G. Golovtchik Transformation of the Labor Market in the Digital Economy. Digital Transformation. 2018;(4):27-43. (In Russ.) pp.:27-43
- [10] Bachelor Degree Programmes/ Official site of educational institution PSU. Available at: <https://psu.by/en/education/bachelor-studies> (accessed 17 April 2019).
- [11] Institute of Professional Development / Official site of educational institution PSU. Available at: <https://psu.by/en/education/professional-development> (accessed 10 April 2019).
- [12] Specialty 1-40 01 73 "Information Systems Software"/ Official site of educational institution PSU. Available at: <https://psu.by/pgu/62-institut-povysheniya-kvalifikatsii/spetsialnosti-perepodgotovki/11390-programmnoe-obespechenie-informatsionnykh-sistem> (accessed 11 April 2019).
- [13] Professional Development 2019 / Official site of educational institution PSU. Available at: <https://psu.by/pgu/38-institut-povysheniya-kvalifikatsii/povyshenie-kvalifikatsii/3643-povyshenie-kvalifikatsii-2019> (accessed 3 April 2019).

- [14] Schedule of training courses for 2019 / Official site of educational institution PSU. Available at: <https://psu.by/pgu/65-institut-povysheniya-kvalifikatsii-obuchayushchie-kursy/8741-plan-grafik-provedeniya-obuchayushchikh-kurosov-na-2019-god> (accessed 2 April 2019).
- [15] Centre of preschool childhood and innovation developmental techniques «UNIVERik» / Official site of educational institution PSU. Available at: <https://psu.by/en/university/89-structural-units/7599-centre-of-preschool-childhood-and-innovation-developmental-techniques-univerik> (accessed 3 April 2019).
- [16] Summer school «STEM – the way to success» Official site of educational institution PSU. Available at: <https://psu.by/en/education/summer-schools/9733-summer-school-stem-the-way-to-success> (accessed 4 April 2019).