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EDUCATION IN THE CONDITIONS OF DIGITAL TRANSFORMATION AND ADAPTATION TO THE STANDARDS OF THE UNIVERSITY OF THE FUTURE

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Abstract: The world's leading universities are in search of new models and are actively rethinking their missions, developing and implementing new technological approaches to learning. Due to the fact that these changes are related to all the main functions that the modern university is expected to perform in different countries, one can speak of a global transformation in higher education. Against this backdrop, the challenge of how to prepare students for life in the age of artificial intelligence, but above all for the professions of the future, is on the agenda. This gives rise to a number of questions to which those employed in the academic sphere in Bulgaria must find an answer as soon as possible, namely: Do the educational system and curricula meet the requirements of Industry 4.0? How to reconstruct the learning process so that we are adequate to the requirements of the new time? How to educate personnel for the needs of Industry 4.0?

In search of an answer to these questions, the observations show that in the field of higher education, including in Bulgaria, dynamic changes are being observed in terms of its role in the economy and in the society of knowledge, the principles and methods of work, the organization and management. Worldwide, universities are exploring and experimenting with new organizational models, reformatting their missions, trying to transcend traditional functions and institutional forms, by developing and introducing new technological approaches to learning. Due to the fact that these changes are related to all the main functions that the modern university is expected to perform in different countries, one can speak of a global transformation in higher education. Against this backdrop, the challenge is how to prepare students for life in the age of artificial intelligence, but above all for the professions of the future? The aim of the present development is to present the transformation towards the application of technologies and new pedagogical approaches, tailored to the specific needs of each student in the course of his preparation for professional realization. Among them are cloud technologies, the flipped classroom, project-based and problem-based learning.

Keywords: University 4.0, transformation, Education 4.0, educational models, cloud technologies, electronic platforms and applications, flipped learning, blended learning

Field: Education

1. INTRODUCTION

Knowledge is considered a major factor in productivity and economic growth. This is why modern economies are becoming increasingly dependent on knowledge and information, which highlights the key role of information, technology and learning in the performance of an economy. Digital transformation is defined as a global reality shaping the way organizations and people interact and will work in the future. Digital transformation is impacting learning across all ages and situations and is rapidly and dynamically changing education and the learning process. More and more digital tools are being incorporated into the educational space almost continuously.

A novelty in pedagogical science is the rapidly emerging educational phenomenon, already known under the name post-pandemic university, and a number of researchers even associate it with the model of the university of the future (Benhayoun, 2020). Among its unique characteristics, one can point out the active use of digital technologies, online and hybrid forms of learning, implementation of basic scientific communication and administrative functions in a remote format, etc. However, there is no unity among experts on the emergence of the post-pandemic university, its level of globalization and networking, the limits of digitalization and the role of face-to-face interpersonal communications.

That is why the publication asks questions related to ways to organize the training process so that it is adequate to the requirements of the new time and quality education for training specialists who meet the expectations of Industry 4.0?. in the publication we give examples of current practices in the field of learning and make the point that transforming learning is not only about using digital devices in the classroom, but also about changing the way of thinking about how learning happens. Educational institutions must perceive technology, but not as an end in itself, and we can claim that in Bulgaria there are already significant investments in the digital ecosystem.

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2. FROM INDUSTRY 4.0 TO THE UNIVERSITY OF THE FUTURE

According to Industry 4.0 ideologist Klaus Schwab, it is based on a synthesis of physical, biological and digital data (Schwab, 2016). Among its characteristics that are most directly accessible to ordinary users are the ubiquity of digital technologies, artificial intelligence, miniaturization and mobility of production and service devices. Automated systems "smart home", "smart production", "smart city" and "smart management" are already a part of human daily life.

To take full advantage of these new technological standards, humanity needs a "revolution" in education. It should provide an opportunity for children from an early age to acquire knowledge and skills for working with technologies that will facilitate their transition to coexistence with intelligent automated systems. New technologies have a number of applications in the modern education system, which can significantly improve educational practice in higher education as well.

The scientific literature offers different parameters of the University of the Future, but all of them are based on the Education 4.0 paradigm, focusing in most cases on aligning education (Education 4.0) with the technological changes of the industrial revolution (Industry 4.0) (Hussin, Mourtzis et al ., Fisk). Following this vector of development, universities must move away from process-oriented, technologically supported mass education systems to a new teaching method that values individualized learning. Flexible learning paths, emphasis on imparting life skills, student-centered learning methods and the use of technology are introducing the concept of Education 4.0 in higher education institutions.

Based on the "interface" of Industry 4.0 and the paradigm of Education 4.0, the parameters of University 4.0 can be outlined, namely:

Flexibility

Industry 4.0 is characterized by the integration of technologies and the blurring of boundaries between the physical, digital and biological aspects of life. Thanks to digitalization, we are not talking about a lost year for students, but at the same time we have become convinced that without them, education can no longer exist. Technology will increasingly influence our work, social and cultural environments. Therefore, it is necessary to ensure that everyone can continue to learn, adapt and apply appropriate technologies to the dynamic learning and working environment, as well as adapt to cultural, economic, political and social progress.

Distance learning

New technologies enable distance learning, which is absolutely accessible to everyone, regardless of their place of residence, social status and educational potential. It is enough to recall the opportunities it provides to students who live in remote or rural areas, for example. Distance learning allows them to attend any college of their choice, no matter how far away from home it is.

Personalized training

This broader integration of technology allows for a more personalized learning experience for students. With tools like artificial intelligence and cloud technology, they can learn at their own pace. The flipped classroom approach plays a key role in enabling interactive classroom learning. These new educational approaches have a major impact on the performance and achievement of children and students.

A new type of exams

Exams are among students' worst nightmares. Many argue that the exams are not practical, as young people "regurgitate" learning content that they forget in the days to come. Thus, after time, entering a certain position and professional institution, they have certain deficits in terms of knowledge, practical skills and professional relations, which makes them insecure and vulnerable in the labor market. While theoretical knowledge can be tested through a traditional exam, its application is best verified through practical-application-oriented activities - projects in the specific field, products related to the application of various tools and applications.

Project-based and problem-based learning

Through project-based and problem-based learning, which are among the approaches recommended by Education 4.0, learning can become practically applicable. It does not focus on theoretical knowledge, but builds skills for independent acquisition of new ones, for teamwork, for quick orientation in the ever-increasing flow of information and finding the right decision in a choice situation. (Fourtané, 2021)

The parameters of Education 4.0 also include online assessment, robotics, artificial intelligence (AI), database, virtual reality (VR), augmented reality (AR) and virtual environment as tools that will replace the cumbersome outdated procedures of conventional education with creativity and attention on the student. Education 4.0 is based on innovation and 21st century learning skills, including critical thinking, creativity, communication and collaboration. They also have a place in the concept of University 4.0.

3. EDUCATIONAL TRANSFORMATION IN THE ERA OF UNIVERSITY 4.0

At the beginning of this part of the publication, we rhetorically ask the question, is the digital transformation in education coming as another change? A change similar to that which education systems in Europe have undergone (over the last 25-30 years), imposed by "external" demands and pressures from a modernizing economy, increasingly noticeable skills gaps, etc. One can speak of a real transformation in the educational systems in Central and Eastern Europe. An example of a transition in the field of higher education is the Bologna Process, which led to the harmonization and standardization of the learning model. An example can be given with adult education in Europe. An example of educational transformations are the current reforms in the education systems in Europe with a focus on STEM (Science, Technology, Engineering, Mathematics) training.

Digital transformation is an inevitable stage in the renewal of education. It has been developing over the last 10 years in parallel with the mass penetration of digital technologies in all spheres of social development.

This process has its own characteristics and goes through well-defined stages. However, there is no single path for all educational institutions to follow. In the process of digital transformation, each educational organization develops along its own, often "exotic" trajectory, which depends on the social policy implemented in the field of education not only in the respective country, but also in the region where the educational institution is located.

The educational transformation in the era of University 4.0 is directly dependent on the development of an effective digital educational environment. This is possible under the following conditions:

1) reforms in education policy;

2) development of modern digital educational content and new educational and methodological complexes;

3) active application of digital technologies and resources and interactive methods in the learning process. They are also related to a qualitative change in the forms of education, which implies a new way of interaction and partnership with students.

The basic minimum of pedagogical technologies, which form the list of new educational solutions and are necessary for building a modern learning process in higher schools, include:

- network communication technology, which serves as the teacher's basis for applying other pedagogical technologies of digital education;

– distance learning technology;

– blended learning technology, including flipped learning and mobile learning;

- technology for organizing students' project activities.

„Distance learning can use a variety of digital online and offline tools, including massive open online courses, video lectures, online conferences, webinars and real-time in-person virtual lectures, online testing, and more. To implement the most promising technology - that of the virtual classroom, both integrated electronic platforms and a combination of different solutions for individual functions can be used. Virtual reality technologies can be used in the implementation of training activities. An important element of distance learning is the presence of feedback - communication between teachers and students" (Dimitrova, 2023: 194).

The most promising varieties and technologies used in distance learning are massive open online courses, adaptive systems (adaptive e-courses), complex case-solving technology, VR/AR simulations.

Technologies for the implementation of blended learning, aimed at expanding the possibilities for individualization of learning, enable full consideration of the educational needs, interests and abilities of students.

In the years of social isolation due to the Covid-19 pandemic, the 1:1 model, an individual device and profile for each learner, has established itself as a global trend in education. In this way, all learners have access to learning content that enables not only learning, but also maintaining social contacts and working together in cooperation through the implementation of practically oriented tasks. This connectivity enables continuous access to information and the possibility to realize conceptual projects. The approval of the 1:1 model also brought to the fore certain difficulties that call into question the idea of equal access to quality education - access to a personal device in the university classroom and at home.

An increasingly applied variant of blended learning is the flipped learning approach. It is implemented according to the formula: independent learning of new educational content (including in online format), combined with practical-oriented activities in an on-site format.

When applying this approach, the direct transfer of knowledge is moved from the group educational space to the individual one. At the same time, this collaborative learning environment in which students

communicate has been transformed into a dynamic and interactive space. In it, the teacher acts as a moderator (mentor, trainer, consultant) and helps students to apply what they have learned at a scientific-abstract level in practice, to develop skills for further work by going independently through the processes of learning, learning, application and development. The core of any flipped learning is the flipped classroom. (Honeycutt, Garrett, 2014)

A study conducted by a Burgas Free University team shows that this method is well known among the university community in our country. The study covers 97 teachers in various subject areas from 27 universities in Bulgaria. More than half of those surveyed - 60.8% - categorically stated that they had tried flipping, meaning that they were well versed in the theory and technological aspects of the approach in order to put it into practice. Just over a third, 34%, admit they haven't tried flipping but intend to do so in the next year. Less than 5 percent (4.1% or 4 respondents) declared that they had no intention of changing their hours. This is not surprising, as the use of the flipped classroom depends on the attitude of the respondents towards the introduction of innovations, their teaching style and the qualities of the learners they work with. Only one respondent (1%) reported that they had tried conversion but did not plan to do so again, i.e. he doesn't like the approach. (Aleksieva, Kotzeva et al, 2022, 398-408)

The conclusion that can be drawn based on the answers of the respondents is that the majority of teachers approve of the flipped-classroom approach and apply it in their lectures and seminars.

The obtained results show that when organizing the interaction with the students, the teacher/lecturer personalizes the learning. For example, students can watch the video lecture prepared by the teacher many times, then stop it, reflect on what they have seen/heard, study at their own pace, regardless of time or place. They can replay the parts of the video lecture that are difficult to understand. Another analogous example, practiced and already tested in the work with the students of the professional field of Pedagogy, is the application of a technological option in which the students are given to solve an online test on a certain topic, with closed questions, from the content of a given academic course before they are given access to the video material created by the teacher using Renderforest (this is an online program with the help of which videos, explanatory animations, thematic videos can be created quickly and easily. The entire editing process is carried out online and synchronized in the cloud). Students familiarize themselves with the content of the video material independently. During seminar exercises, strategies related to components of critical thinking are applied - approach to the problem, systemic thinking, evaluation of arguments, formulation of conclusion and revision of results. As feedback, an online test is used again, but now with open questions.

"Turn around" is about effective time management. In a competency-based approach, learners are encouraged to take more responsibility for their own learning and become more independent as the lecturer does not provide them with the information in advance. (Turan, Acdag-Cimen, 2020, 598).

In the context of the digital economy, the importance of project-based and problem-based learning consists in the fact that the logic of the activity of students working on a project fully or partially corresponds to the logic of modern project management with the corresponding stages (identification of a problem/need - search of an idea - setting a task - designing - testing and correcting a product - introducing and promoting the product - managing the product). By carrying out projects, students gain experience, on the basis of which a set of universal competences demanded by the digital age is formed.

In addition, the assessment of the progress and the results of the completed project allow to make a complete and objective assessment of the degree of formation of the universal competencies of the students participating in the project activities.

With the application of digital technologies, project activities acquire new dimensions. Using network technologies and digital communication tools, students, divided into teams, have the opportunity to create so-called network projects. Along with other universal competences, this type of interaction supports the formation of knowledge and skills for digital competence and digital creativity.

4. CONCLUSION

With the massification of education worldwide, the design of both traditional and current education systems has deficiencies that prevent ensuring access to quality, responsive education for all. Therefore, it is essential to adapt/transform the current education systems to create a flexible system that guarantees education that meets the parameters of the fourth industrial revolution and beyond. It is the responsibility and obligation of those working in the higher education system to focus on the rational application of information and communication technologies. It is also necessary to create a mind-set for future technologies that will accompany lifelong learning and thus ensure adaptability and flexibility of an education system.

With conversations about the challenges posed by the fourth industrial revolution, the higher education community should be debating how to reformat the education system into an adaptive, flexible and relevant social environment. An environment that enables the entire community to learn throughout life to develop skills and competencies that are necessary, applicable and adequate throughout the next industrial revolutions.

REFERENCES

Aleksieva, M., Kotzeva T. et al. (2022). Flipped classroom trends in Bulgaria: results from the survey. In International scientific conference The Black Sea – Doors and Bridges. 398-408. URL: https://www.bfu.bg/uploads/pages/sbornik-conf2022-cherno-more.pdf [viewed 2024-22-01].

Benhayoun, J. E. (2020). The new global university in the post-COVID-19 world. University world news //The global window of higher education. URL: https://www.universityworldnews.com/post.php?story=20200704092348232 [viewed 2024-22-01].

Dimitrova, Zl. (2023). Digital transformation - competence and creativity in kindergarten and school. Eks pres. Gabrovo, Bulgaria.

Fisk, P. (2017). Education 4.0 ... the future of learning will be dramatically different, in school and throughout life. URL: http://www.thegeniusworks.com/2017/01/future-education-young-everyone-taught-together/ [viewed 2024-22-01].

Fourtané, S. (2021). 9 Trends to Look for in Higher Education 4.0. URL: https://www.fierceeducation.com/best-practices/9-trends-to-look-for-higher-education-4-0 [viewed 2024-22-01].

Honeycutt, B., Garrett, J. (2014). Expanding the Definition of a Flipped Learning Environment (pp. 12–13). In: Blended and Flipped: Exploring New Models for Effective Teaching & Learning. (pp. 12–13). URL: https://www.desu.edu/sites/flagship/files/document/16/ff-blended-and-flipped-specialreport.pdf [viewed 2024-22-01].

Hussin, A. (2018). Education 4.0 Made Simple: Ideas for Teaching. International Journal of Education and Literacy Studies. 6, 92-98.

Intelitek report.: The Education 4.0 Revolution. Analysis of Industry 4.0 and its effect on education. (2018). URL: https://e4-0.ipn.mx/wp-content/uploads/2019/10/the-education-4-0-revolution.pdf. [viewed 2024-22-01].

Mourtzis, D.,Vlachou, E., Dimitrakopoulos, G., Zogopoulos, V. (2018) Cyber-physical Systems and Education 4.0 -The Teaching Factory 4.0 Concept. Procedia Manufacturin. 23. 129-134.

Schwab, K. (2016). The Fourth Industrial Revolution: What It Means, How to Respond. World Economic Forum. URL: https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/ [viewed 2024-22-01].

Turan, Z., Acdag-Cimen, B. (2020). Flipped classroom in English language teaching: a systematic review. Computer Assisted Language Learning. vol. 33. 5-6. 590-606. URL: https://www.tandfonline.com/doi/full/10.1080/09588221.2019.1584117?scroll=top&needAccess=true [viewed 2024-22-01].