DIGITALIZATION IN EDUCATION.
IN THE WAKE OF RESEARCH*

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Abstract

The article examines the impact of digital transformation on classical universities and its dialectical impact on the global strategy for sustainable development (ESD). The authors present findings from a study on the experience of the ecosystem approach in the educational system, specifically in additional vocational education. The study identifies the directions of development for additional vocational education as an ecosystem during the digital transformation stage of higher education. The article discusses changes in education resulting from the expansion of distance learning, and how the role of universities is evolving. Using an interpretative approach, the current realities and trends of the digital transformation process in Russian education are explored.

Keywords: competencies, crisis, digital transformation, distance education, ecosystem approach, higher education, online courses, problems, solutions

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1. Introduction

Digital transformation is a new type of economy, something that the world has been moving towards in recent decades. Increasingly, we are faced with the fact that digital technologies are the main tool of formation. The goal of digital transformation is to use modern technologies to increase the productivity and value of enterprises to ensure competitiveness.

In the new era of human development, the concept of "digital literacy" is a basic component of education and scientific and technological progress. In the general definition, this concept includes the degree of mastery of basic cognitive skills: reading, writing and counting in the native language. But with the development of technology and the complexity of the information space in which we exist, the concept of literacy is expanding.

Digital society is a new stage in the formation of civilization, which is distinguished by the role of knowledge and information in all spheres of society, while ICT has a major impact on the way of life of mankind, on their education and work (Rakhymbekova et al., 2022).

2. Method

The digital transformation of education and society as a whole has recently been devoted to many publications of a very different nature, in which it appears to be one of the main global trends in the development of modern civilization. The term "digital transformation" in a narrow sense is used to refer to the process of integrating digital technologies for processing, storing and transmitting information into various spheres of public life. In a broad sense, it means a whole range of measures related to the renewal of the material and technical base, the introduction of innovative technologies and advanced scientific knowledge, the reorganization of the system of public relations, the change of ideological attitudes and lifestyle of the individual. Digital transformation is often presented both as the main direction (goal) and as a tool for the successful modernization of modern society. It is quite natural that much attention is paid to discussing the actual and negative consequences or side effects of digital transformation (Dobrorodny, 2021).

Speaking about digital transformation, we understand the radical changes that affect all areas of our lives thanks to modern technologies. Modern digital technologies could not but affect the field of education. So today, the learning process can no longer be imagined without the use of mobile applications, interactive whiteboards, the Internet and technological developments (e-mail, software for storing, presenting, processing data etc.). Therefore, despite the established foundations and traditions in the field of education, it should take one of the leading places in the digital transformation of the national economy, by means of a radical transformation of business processes in all spheres of public life and ensuring socio-economic development based on the use of modern digital technologies. This approach will allow us to prepare specialists for the future who are able to adapt quickly in a competitive environment, quickly perceive and transmit new knowledge.

In the process of digital transformation, the very structure of education and the organization of the educational process are fundamentally changing. Methodological digitalization of the education system should be based on new educational standards, using a new competence-based approach. It also requires tools for creating educational materials, tools for effective delivery of content and students' knowledge for effective teaching, in order to broadcast information in a language understandable to a modern young person. The teacher will need to learn how to work with cloud technologies, artificial intelligence, ICT; learn how to analyze digital resources for the possibility of expanding their pedagogical boundaries and building a digital self-identity; and in general, adapt themselves to enter the environment of digital pedagogy.

It is important that these trends are typical for educational institutions of any level: schools, lyceums, colleges, institutions of higher education, for business schools. Digital transformation stimulates the need to change approaches to the formation of competencies of students (students,
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listeners) at all levels of the education system. The competence "the ability to learn throughout life (including independently)" comes to the fore, to be able to receive only the necessary and in-demand information from the general large flow, to be able to reduce information threats, to be ready at any moment to change the type of activity and profession in the transforming needs of producers in the labor market. Since manufacturers no longer need workers who will work for 20-30 years using the same technology in the production of the same type of products. New professions appear almost every 3-5 years, so the requirements of the modern world are changing for graduates of universities and schools. The school should use tools that would contribute to the formation of young people's knowledge of how to study and stimulate the need and desire to study further, throughout life.

As for higher education as a source of highly skilled labor, thanks to digital transformation, it strengthens the process of differentiation and specialization. Universities should turn into "an arena for the production of competing prospects for the future" (Rozin, 2021). The main task of the university today is to form not just a professional in his field, but a transfessional, i.e. a person who has the competence to quickly change his professional skills and change himself along with a change in profession, to live beyond the boundaries of professionalism.

In the context of the increasing pace of digital transformation of society, universities around the world are trying to use the most effective technologies and teaching methods (Rakhymbekova et al., 2022). At the same time, against the background of the general globalization of higher education and the highly skilled labor market, there is an increasingly clear trend towards the mass use of cloud services in academic education and science, and the most significant universities are switching to servicing (external) data centers (data processing centers) and creating integrated (inter-university) platforms based on them in order to save money and expanding the scope of joint educational and scientific activities. Such changes in infrastructure contribute to further improving the economic efficiency of higher education at the national, regional and local levels, contribute to the expansion of international cooperation in the field of education and science (Rakhymbekova and Ten, 2018).

Universities began to master new formats of knowledge transfer, primarily online courses. Changes in education related to digitalization will lead to profound changes in the labor market. Which, in turn, will be a reason for further reorganization of the educational process. Electronic library resources of the world's leading universities, as well as educational materials and developments of the best teachers will be available to any student. In the near future, systems for automatic translation of spoken speech, including texts from any language of the world, will be developed and implemented. Such actions will lead to a serious restructuring of the educational process, a change in the role of the teacher, who in the future will not explain this or that material, but will help to find the location of this material and understand it (Mashevskaya, 2019). The sphere of education is no exception, perhaps, along with the economy, it is the locomotive of digitalization (Rozin, 2021).

3. Results

The fact that the digital transformation of education is one of the most important and irreversible trends of our time, for all researchers involved in this field of activity, as it seems to us, without exception, is an obvious fact and it is almost impossible to find opponents on this issue. Another thing is that it is impossible not to pay attention to the fact that until recently (before the pandemic with the damned coronavirus COVID-19), there was an intensive search for new strategies and models of education of the XXI century all over the world, and without lying, few people focused on the new technological possibilities of educational activities related to the fact that now they have received the generalized name of digital transformation.

Moreover, we can safely say that the evolutionary series of numerous national models and strategies of educational processes and systems on a global scale at the beginning of the third
millennium begins to move, according to UN decisions, to a model of world education related to
the Sustainable development strategy (ESD).

How to stay here and not bring the main milestones on the way to ESD?

Most authors, speaking about the history and prerequisites for the development of ESD, note
the following key dates:

– 1972 Stockholm Conference;
– 1977 Tbilisi Conference on Environmental Education;
– 1987 Moscow Conference on Environmental Education (Tbilisi+10);
– 1987 Report of the World Commission on Environment and Development (Brundtland
Commission);
– 1992 World Summit in Rio de Janeiro (UNSC), Agenda for the XXI century;
– 1996 (1998 – revision) UN CSD, "International Program of work in the field of education,
public awareness and training”;
– 2002 World Summit on Sustainable Development;
development of an ESD Strategy for the UNECE region;

In June 2002, during the 4th Preparatory Committee for the WSSD, Bali, Indonesia, the
Government of Japan for the first time put forward the idea of holding the UN Decade on Education
for Sustainable Development (SDD). In September 2002, in Johannesburg, South Africa,
Governments at the highest level supported this proposal at the World Summit on Sustainable
Development. On December 20, 2002, the UN General Assembly adopted Resolution 57/254 on
the implementation of the SDGs in 2005-2014. At the same time, the state of ESD in Russia is very
difficult to characterize unambiguously. At first glance, we can say that, as such, there is no ESD
at the systemic state level in its modern understanding in Russia.

On the one hand, it is impossible to write off a lot of implemented projects, created
educational programs, a huge number of publications, conferences, initiatives and developments
existing in this area (Bardakov, 2021). Changes in the field of economy, labor and employment in
Russia indicate the need for a rapid and adequate response of educational institutions. Additional
vocational education (DPO) is seen as the most successful option in solving the problems arising in
connection with these changes, largely due to high mobility, short-termism and market conditions
of the orientation of the content of educational programs (Achkasova).

Thus, DPO allows not only to develop existing knowledge, but also to form new skills and
competencies and apply them in new socio-economic conditions. In order to create competitive
advantages and implement national projects and programs, universities have found themselves in a
situation of constant updating, development and expansion of educational programs for vocational
training, taking into account the development of the regional labor market. The structure of the
university's DPO includes various interacting elements: students, teachers, administrators and
methodologists, educational and methodological complexes implemented using various
pedagogical and educational technologies in the digital educational environment, management of
the DPO unit and educational marketing of services promotion in the market.

The importance of a teacher, the profession of a teacher in the modern education system
remains unchanged, but its role is changing. The teacher must possess key professional
competencies, possess modern educational technologies and actively use them in the educational
process. For the full integration of a modern teacher into the educational system, a number of
obvious professional shortcomings are hindered, among which there is obviously insufficient
possession of digital skills (Rakhymbekova et al., 2022). We consider the complex of these
interacting elements in the structure of the university's DPO as an ecosystem of the university's
DPO.

From a scientific point of view, the ecosystem approach is in a state of formation. The
increased interest in the formation and development of the ecosystem approach in Russia is
associated with the prospects for the implementation of the state policy of innovative development of the country, including within the framework of the projects "National Technological Initiative" and "University 2035", the methodological basis for which is formed by the Agency for Strategic Initiatives and the Russian Venture Company. In 2020, the Moscow School of Management Skolkovo and the organization Global Education Futures conducted a study in which they examined educational ecosystems. Using the example of more than 40 educational ecosystems from around the world, experts came to the conclusion that the new approach will lead to changes in many areas of life: it will show new ways of learning, thinking, teach new ways to live and cooperate, learn, retrain, adapt to different situations through various educational formats (Achkasova, 2022).

The concept of "ecosystem" is borrowed by pedagogy from ecology and is defined as a single natural complex represented by a stable unity of living and inanimate objects on the same territory; in this system there is a circulation of substances and an interchange of energies, while the system independently regulates all these processes (Bardakov, 2021).

Luksha P. defines educational ecosystems as networks of interconnected and diverse subjects involved in the process of education / upbringing / development throughout life. Educational ecosystems unite students and communities, striving to unlock their individual and collective potential. They are diverse, dynamic and constantly evolving. The (ultimate) goal of educational ecosystems is to create a prosperous future for people, communities and the planet (Rakhymbekova and Ten, 2018). Fominykh N. Yu. believes that the subjects of the educational ecosystem exchange knowledge throughout their lives, being sources of development for each other, just as in a natural ecosystem there is an exchange of energy between natural components (Dobrorodny, 2021). Vasyutenkova I. V. defines the educational ecosystem as a complex of educational technologies and resources that ensure the individualization of the personal development of subjects of the educational environment on the basis of effective forms of interaction of its components (Rozin, 2020).

The role of DPO in the formation of future competencies in the educational ecosystem was studied by Timchenko V.V., Karanatova L. G. and Kulev A. Yu. (Rakhymbekova et al., 2022). We consider the DPO system as an ecosystem of the university's DPO. From our point of view, the ecosystem of the university's DPO is a network community focused on the implementation and development of additional professional training programs and professional retraining in order to form students' competencies that are in demand in the labor market, based on the use of modern educational technologies in the digital educational environment. Any ecosystem is characterized by the presence of a common goal and development directions shared by all members, based on mutually beneficial interaction (Achkasova, 2022).

Specialists who are trained to work with information technologies are a key factor in the development of the digital economy. The requirements for IT training are included in the professional standards of teachers. The use of these requirements is beyond technical competence and requires an expanded understanding of the methodological training of teachers to work in an educational environment. Information technologies in the educational process of universities are considered from the perspective of the use of distance learning technologies and e-learning. It is difficult to distinguish between information technologies and digital technologies now, because a new stage of IT development is currently being formed and formed. Digital technologies are primarily a set of information technologies, including digital platforms, for the application of which new areas have been found, for example, artificial intelligence or additive technologies. In educational organizations, the traditional system of education, which is implemented in full-time education, is still a priority. The circumstances that developed in the spring of 2020 changed the learning conditions and gave an accelerated form to the process of digitalization of education.

Currently, the following forms of education are distinguished:
- traditional (the teacher unilaterally transmits information to students);
- distance (Mass open online courses);
- mixed (using online resources).
According to forecasts of market analysts, Russians will spend an average of 42,000 rubles a year on distance learning programs in higher education by 2022. The most dynamic segments developing in this area are courses for preschoolers and additional courses for schoolchildren. Again, analysts predict that about 15 billion rubles will be concentrated in this market in the near future. And such interest in this industry can be explained by the fact that online education is legitimate. More and more employers evaluate potential employees based on the skills and competencies that the latter possess, rather than documents issued by various educational organizations.

However, the attitude in society to the current trend is ambiguous. So far, users themselves in most cases have a negative attitude to such education (more than 50%) (Bardakov, 2021). Only 38% of employers are ready to perceive such an education as meeting the requirements (Rozin, 2021). Also, there are restrictions everywhere for the development of online education:
– unavailability of infrastructure;
– the need to completely restructure business processes in education;
– formation of social capital.

At the same time, not everyone can use this form of education to invest in their human capital, since certain character traits are necessary for this form of education:
– the ability to learn;
– independently build your own educational program;
– they don't teach you to study independently in modern schools.

It is worth noting that modern students, entering higher education, face a lack of necessary skills and need:
– the patronage system;
– control over the execution of tasks;
– analysis of tasks.

Now a high school teacher is more like a tutor who guides, helps to navigate the educational space, advises on the relevance of certain knowledge. In the conditions of the digital economy, the teacher ceases to be a source of knowledge, now he is a teacher whose main task is to teach how to find the means to achieve his goals independently. A fairly striking manifestation of this trend is that leading universities (in Russia, the Higher School of Economics was the first to announce this) are taking out basic courses for independent study, online. And now the student has the choice to attend classroom classes or remotely master the discipline. But, of course, such a choice is not possible for all disciplines.

Now the student is tasked to focus on project work, experiments, laboratories, research seminars, and for this, visiting a university becomes a necessary task. And, as a result, the role of the university is also changing. Now the higher school provides personal contact of the student with the teacher, with classmates. A team is organized, projects are organized, research skills are organized. There are no single researchers today.

The transfer of knowledge, especially theoretical knowledge, fades into the background, the main thing is the organizational function. The process of becoming a team cannot take over the business. We need the skills to commute, set tasks, solve them. The diploma loses weight, acquired skills become a priority. There are no uniform standards, so the quality of online courses is not always high.

An important indicator of the quality of training and at the same time one of the key elements of the human capital stock, measured on the basis of an assessment of past efforts, is the cost of financial resources. However, efforts aimed at accumulating human capital in the formal education system are not limited to financial investments. Equally important is the contribution of students' own labor costs (Shlyakova, 2019). With the advent of information systems, in addition to traditional formats, a mixed or hybrid learning system is being created. The concepts of hybrid learning and blended learning (English "Blended Learning") are considered synonymous.
Hybrid learning is a combination of elements of innovation with a traditional form of learning. Mixed learning involves a mixture of one and the other, based more on mechanical mixing, so these concepts are considered synonymous. In corporate and higher education in the sixties of the twentieth century, the basic principles of blended learning began to be applied, but the term was first used in 1999, at a time when the American Interactive Center released software that was intended for teaching via the Internet.

The main characteristics of the definition of blended learning include:
- use of computer technology and the Internet;
- the presence of minimal personal interaction between teachers and students.

There are the following forms, which are distinguished depending on the duration of online training:
- training using the Internet, web-enhanced (minimal use of online activities, reduced to the placement of the program and course announcements);
- blended learning, blended (up to 45% of online activities);
- hybrid learning, hybrid (45-80% of online activities);
- distance learning, fully online (more than 80% of the total study time is occupied by online activities).

Six models of blended learning of foreign practice:
1. The "Face-to-Face Driver" model – in an educational institution, a certain part of the curriculum is studied in direct interaction with the teacher. An addition to the main program is e-learning, which consists in organizing work with electronic resources at computers during the lesson;
2. The "Rotation" model – study time is divided into training with a teacher and individual e-learning;
3. The "Flex" model – more than half of the curriculum is mastered and worked out on the basis of e-learning in a distance format, which consists in organizing face-to-face consultations with small groups or individually;
4. The "Online Lab" model – e-learning is organized in educational institutions equipped with computer technology. Online learning can be combined with the traditional form and is accompanied by a teacher;
5. The "Self-blend" model is a traditional model of American high schools. Students have the opportunity to independently choose additional courses for basic education. Educational content providers are various schools and educational institutions;
6. The "Online Driver" model – with the help of electronic resources of the information and educational environment, most of the curriculum is mastered, combined with face-to-face consultations and exams.

Thus, global changes in the world and changes in people cause mixed digital learning formats. By combining traditional teaching methods and modern technologies, innovations in the information environment contribute to the widespread use of absolutely all learning opportunities (Golovach et al., 2020; Dobrorodny, 2021; Mashevskaya, 2019; Sergushina et al., 2021).

4. Conclusions

In conclusion, the impact of digital transformation on the learning process will bring about new and diverse ways of teaching, allowing for the involvement of even the most passive learners. However, it is important to note that digitalization also has its downsides, which can negatively affect the intellectual and physical development of younger generations. These downsides include increased tension and awkwardness in live communication, emotional overload due to large amounts of information, steady internet addiction, access to undesirable information, and the risk of cyberbullying and aggression in the online environment.
Researchers are also studying the impact of "screen time" on health, sleep, and physical activity. Therefore, digitalization of education should be organized in a way that maximizes the positive impact of innovation and minimizes the negative effects.

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