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Цифровая трансформация высшего образования: компоненты и условия функционирования (на примере Самарского государственного экономического университета)

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Аннотация. Цель исследования – обосновать компоненты и условия цифровой трансформации высшего образования. В статье рассматривается состояние цифровой трансформации образования на примере Самарского государственного экономического университета и способы его улучшения. Научная новизна заключается в следующей выдвигаемой гипотезе: преподаватель отдельного вуза, заинтересованный в повышении своей компетентности вообще и цифровой компетентности в частности, будет востребован в условиях цифровой трансформации образования при: 1) грамотном использовании информационно-коммуникационных технологий в учебном процессе; 2) постоянном повышении цифровой компетентности; 3) наличии развитой цифровой среды вуза. Основные результаты исследования: проведены обзор и анализ состояния проблемы цифровой трансформации образования; проанализированы определения и компоненты цифровой образовательной среды и цифровой компетентности преподавателя, представленные различными авторами и коллективами авторов; сформулировано авторское определение понятия цифровой компетентности преподавателя вуза; обозначены преимущества информационно-коммуникационных технологий и способы повышения уровня сформированности цифровой компетентности преподавателей вузов; представлен опыт создания цифровой образовательной среды Самарского государственного экономического университета.

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Digital transformation of higher education: Components and conditions of functioning (on the example of Samara State University of Economics)

Gromova T. V.

Abstract. The aim of the study is to substantiate the components and conditions of the digital transformation of higher education. The article examines the state of the digital transformation of education on the example of Samara State University of Economics and ways to improve it. The scientific novelty of the study lies in the following hypothesis: a university teacher who is interested in improving his/her competence in general and digital competence in particular will be in demand in the context of the digital transformation of education provided that the following conditions are met: 1) the competent use of information and communication technologies in the educational process; 2) the continuous improvement of digital competence; 3) a developed digital environment of the university. The main results of the study are as follows: a review and an analysis of the problem are conducted; the definitions and components of the digital educational environment and the digital competence of a teacher presented by various authors and teams of scientists are analyzed; the author's definition of the digital competence of a university teacher is formulated; the advantages of information and communication technologies and ways to increase the level of the digital competence of university teachers are outlined; the experience of creating a digital educational environment of Samara State Economic University is presented.

Introduction

Digital transformation is defined as one of the development goals of the Russian Federation for the period up to 2030 (О национальных целях развития Российской Федерации на период до 2030 года: Указ Президента

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Российской Федерации от 21.07.2020 г. № 474. URL: http://www.kremlin.ru/acts/bank/45726). It is obvious that the digital transformation of society is impossible without the digital transformation of the education system, and modern society requires university education based on active and participatory educational models that allow the development of teacher competencies, with digital competence being one of the most demanded.

One of the constraints on the way of the digital transformation of education is the insufficient readiness of teachers, in particular university teachers, to carry out activities in the digital educational environment (Нугуманова, Шайхутдинова, Яковенко, 2019; Бороненко, Федотова, 2021), which (digital educational environment) is declared to be implemented in the Russian Federation by 2024 (Паспорт стратегии «Цифровая трансформация образования». 2021. URL: https://docs.edu.gov.ru/document/267a55edc9394c4fd7db31026f68f2dd).

Modern living conditions of every person are to one degree or another connected with progress and transition to an information society. Information and communication technologies (ICT), including Internet access, data transfer technologies, hardware, software, communication technologies, cloud data processing, cloud computing, etc., allow people and organizations to interrelate in the digital world. However, given the conservative nature of education, more and more specialists in this field are more likely to believe that digitalization is a global modification that affects the education system by changing the forms and methods of teaching. Digital technologies are not just a tool, but also an environment that opens up new opportunities, such as flexible learning schedules, individualization of learning and, consequently, more opportunities and prospects for continuing education. Describing the essence and content of the digital transformation of education, a number of researchers (Уваров, 2018; Pollock, Schwartz, Buck, 2018) agree that it should allow the flexible and effective use of the latest technologies for the transition to a purposeful, individually oriented educational process.

The results of studying relevant sources, monitoring the implementation of digital transformation and analyzing the functioning of digital projects at Samara State University of Economics led to the conclusion that the digital competence of the teacher, information and communication technologies and the digital educational environment are the key components of the digital transformation of education. The necessary conditions for the digital transformation of education are the following: the presence of a developed digital educational environment at the university, the presence of teachers who are well-versed in modern ICT and increase the level of formation of their digital competence.

The study of components and conditions of the digital transformation of higher education was conducted at Samara State University of Economics, a member of the Consortium of Regional Economic Universities (a number of associations of universities, research institutes and enterprises in the Russian Federation united on a professional basis to participate in the “Priority-2030” program (Более 100 вузов объединились в консорциумы для участия в программе «Приоритет-2030». 15.07.2021. URL: https://skillbox.ru/media/education/bolee-100-vuzov-obedinilis-v-konsortsiumy-dlya-uchastiya-v-programme-prioritet2030/; Консорциум региональных экономических университетов. URL: https://www.sseu.ru/press-centr/konsorcium)), which involved the digital educational environment and teachers of this university.

The relevance of the study is justified by the challenges of the digital transformation of education, focusing primarily on the improvement of all types of digital activities of a university teacher and is determined by the state policy of the Russian Federation in the field of the digital transformation of society in general and the digital transformation of education in particular.

To realize the research aim, the following tasks were established:

- to consider the problem of the digital transformation of education and analyze the definitions of the digital educational environment and the digital competence of the teacher presented by different authors and teams of scientists;
- to formulate the author’s definition of the digital competence of the university teacher;
- to identify components and constituents of:
  - the digital educational environment (DEE);
  - the digital competence of the teacher;
- to outline:
  - advantages of information and communication technologies;
  - ways to increase the university teacher’s digital competence;
- to present the experience of creating the digital educational environment of Samara State University of Economics.

Theoretical (identification of the contradictions of the problem under consideration, analysis, synthesis, etc.) and empirical (comparison, observation, survey) research methods were used in the work.

The theoretical basis of the research were scientific developments of foreign and Russian scientists devoted to: the importance of information technologies in training students for their future professional activities (Pollock, Schwartz, Buck, 2018); defining the components of the digital age educational ecosystem (Clark T. The Components of a Digital Age Learning Ecosystem. 2014. URL: https://www.educatorstechnology.com/2014/11/the-8-components-of-digital-learning.html); elements of digital literacy competence (Gilster, 1997); the importance of professional digital competence in pedagogical education (Lund, Furberg, Bakken et al., 2014); the level of information literacy of secondary school teachers (on the example of Spain) (Álvarez, Gisbert, 2015); teacher education for ICT integration in classroom (Mena, Singh, Clarke, 2018); information and communication technologies in continuing teacher training (Escudero, Martínez-Domínguez, Nieto, 2018); the usage of digital technologies in the context of digital transformation (Уваров, 2018); components of the digital educational environment (Назарова А. Основные компоненты цифровой образовательной среды. 2021. URL: https://www.maam.ru/detskijsad/osnovnye-komponenty-cifrovoi-obrazovatelnoi-sredy-do.html); the digital competence of university teachers (Бурганова, Юрьева, 2022).

The practical significance of the work lies in the fact that a review and an analysis of the problem of the digital transformation of education are conducted; the definitions and components of the digital educational environment and the digital competence of a teacher presented by various authors and teams of scientists are analyzed; the author's definition of the digital competence of a university teacher is formulated; the advantages of information and communication technologies and the ways to increase the level of the digital competence of university teachers are outlined; the experience of creating the digital educational environment of Samara State Economic University is presented. The results obtained can be used by teachers and administrators in organizing the educational process in educational institutions of various types and levels; as well as by specialists professionally engaged in the creation of and ensuring the functioning of the digital educational environment of educational institutions.

Discussion and results

As previously stated, one of the main components of the digital transformation of education, along with ICT and the digital competence of the teacher is a digital educational environment, which many researchers consider as a multi-level and multifunctional didactic system and examine it taking into account different aspects.

For example, A. Nazarova identifies the following components of the DEE: a distance learning system, an official distance learning website, an e-mail, an electronic document management system, a corporate portal, a computer technology user support system and an electronic report card (Назарова, 2021).

T. Clark (2014) describes 8 elements that make up the digital learning environment (though the author of the article questions the appropriateness of using the term "ecosystem" as a complicating term to describe the subtleties of learning): 1) a sense of community, 2) essential questions, 3) captivating digital content, 4) assessment for learning, 5) a variety of learning tools, 6) differentiation and accessibility projects, 7) a favorable environment in the classroom, 8) engaging learning strategies.

M. Shutikova and S. Beshenkov (2020) identify such factors of the DEE as scientific and technological achievements, socio-economic conditions, modern information and methodological, didactic and educational tools based on digital technologies.

O. F. Prirodova, A. V. Danilova, A. N. Morgun consider the components and methodological foundations of the formation of the digital educational environment, its integration into the digital space and connections with the non-digital educational environment (Природова, Данилова, Моргун, 2020).

I. Golovanova and her colleagues (Golovanova, Alipichev, Ayupov et al., 2022) take into account not only the level of development of digital competencies of students and teachers, but also their basic needs in this area to create a comfortable and efficient digital environment in universities.

V. Kuznetsova, I. Azhmukhamedov (2020) consider the high-tech information educational environment as the one including, among other things, the educational organization, students' place of residence and stay.

It is obvious that information and communication technologies play a crucial role in the digital transformation of education. The great demand for ICT in the modern RF education system, among other things, is due to the things listed below:

- meeting students' educational needs regardless of their place of residence, income, state of health;
- developing intellectual skills and the reflection process of students that contribute to planning, evaluation, monitoring, control, reflection, etc.;
- developing communication skills, encouraging student collaboration;
- allowing students to participate in online learning;
- providing the opportunity for students to use e-learning, which has become especially popular during the coronavirus pandemic;
- contributing to the mastery and consolidation of knowledge gained in and outside the classroom;
- creating the possibility of ICT use in the main curriculum as an important part of the planning of education and vocational training;
- contributing to the development of knowledge, penetrating into all spheres and levels of education, production, environment, health, etc.;
- ensuring inclusiveness by equalizing the opportunities of students with special needs who are no longer at a disadvantage in realizing their own educational needs.

Despite the importance of ICT and the DEE, the key figure without whom the transformation of education is impossible is the teacher. It is clear that in the digital educational environment, the roles and functions of a teacher are changing, who turns from a single source and deliverer of knowledge to a multifunctional teacher – a mentor with the ability to guide, correct, motivate and support students and many other skills and abilities. This is discussed in detail in (Glukhov, Gromova, 2016). In this article, we will focus on the university teacher's digital competence.

In the existing regulatory framework (Об образовании в Российской Федерации: Федеральный закон от 29.12.2012 г. № 273-ФЗ. URL: https://www.consultant.ru/document/cons_doc_law_140174/), there are no definitions of "digital competence" and "digital literacy". The idea of "digital literacy" was first introduced in 1997 by the American writer and journalist P. Gilster (1997), who identified the following for digital competence:

1) skills of finding the necessary information and tools for working with it, the ability to quickly master these tools (information competence);
2) communication skills with other users (communicative competence);
3) skills of information production in its various forms and formats (creative competence).

Different scientists have interpreted the concept of digital competence in different ways. Thus, according to a team of Norwegian scientists (Lund, Furberg, Bakken et al., 2014), digital competence includes not only digital, pedagogical and subject-oriented skills of teachers, but also awareness of the need for continuous development through pedagogical education and teaching practice in the classroom.

L. A. Burganova and O. V. Yuryeva understand digital competence as "a set of standard behavioral indicators reflecting the knowledge, skills and abilities of stable and creative use of digital devices and cloud technologies by university teachers, their readiness to solve problems related to the development of their digital professional competencies, digital pedagogical competencies, the formation of digital competencies of students" (Бурганова, Юрьева, 2022, p. 126).

The author of the article defines digital competence as the ability of a teacher to use information and communication technologies in combination with pedagogical and didactic tools in the context of understanding how this can affect the learning strategies and educational formation of students, and students' ability to function safely and productively in various environments of the professional digital world.

If we turn to the profile of the digital competence of teachers developed by the European Union, it defines 22 competencies in 6 thematic areas: "Professionalism", "Digital Resources", "Training", "Assessment", "Empowerment of Students", "Development of Digital Competence of Students", it reveals an understanding of the skills needed by teachers in the digital age (Digital Competence Framework for Educators (DigCompEdu). URL: https://joint-research-centre.ec.europa.eu/digcompedu_en).

Ideally, the formation of the digital competence of university teachers in the context of their preparation for work in the conditions of the digital transformation of education should be carried out in advance, before the start of their professional activities. Nevertheless, various studies have shown that so far the initial training programs for future teachers in digital competence have been rather weak (Álvarez, Gisbert, 2015; Mena, Singh, Clarke, 2018). This may be one of the main reasons for the unsuccessful integration of ICT into the educational program. And although the successful integration of ICT into educational practice can be realized only with the appropriate preliminary training of teachers in the field of digital competence (Escudero, Martínez-Domínguez, Nieto, 2018; Romero-García, Buzón-García, Paz-Lugo, 2020), the circumstances are such that teachers have to improve their digital competence in the course of their professional activities.

The most effective ways to increase the digital competence of teachers according to the results of a survey of teachers of Samara State University of Economics (SSEU) (the survey of 69 teachers of SSEU was conducted in November-December 2022) are:

- professional development courses and internships (49.3%);
- creation of a developed digital educational environment for teachers' interaction (33.3%);
- methodological and informational support of teachers, introduction of a system of work in tandem, mentoring (17.4%).

Improving the digital competence of a teacher can be centralized, organized by the administration and specialists of the university; teachers and all interested persons can also independently take training courses. Among such courses, the following can be distinguished:

- Digital Literacy of Teaching Staff of Educational Organizations (Цифровая грамотность педагогических работников общеобразовательных организаций. Использование новейших информационных технологий в образовательном процессе. URL: https://ropkip.ru/kursy/2789).
- Digital Literacy of a Teacher. Distance Learning Technologies (Цифровая грамотность педагога. Дистанционные технологии обучения. URL: https://infourok.ru/kursy/Cifrovaja-gramotnost-pedagoga).
- Digital Technologies in the Work of a Teacher (Project of the Ministry of Labor and Social Protection of the Russian Federation) (Бесплатное обучение по программе: «Актуальные цифровые технологии в работе педагога, репетитора, коуча». URL: https://tgu-dpo.ru/program/digitalteacher).

For a third of the surveyed SSUE teachers, the presence and functioning of a developed DEE of the university is a determining condition for effective professional activity in the digital transformation of education. During the last few years, a number of projects have been widely and effectively used at Samara State University of Economics in the context of forming the digital educational environment:

The project "Automated Point-Rating System for Assessing Students' Academic Performance"

Project goal:

- automation of the process of formation of an accumulative complex system for assessing the level of results achieved by students and the fostering of competencies defined by the academic discipline by all types of practices in main professional and additional educational programs.

Project objectives:

- introducing the public, understandable and transparent criteria for assessing students' academic performance;
- increasing motivation for the development of educational programs;
- improving the quality of training by optimizing methods, tools and technologies of training as a result of ongoing monitoring.

Advantages of implementation for the members of the Consortium of Regional Economic Universities:

- monitoring students' learning outcomes in real time in order to take timely response measures;
- monitoring of discipline performance by scientific and pedagogical workers within the educational process;
- obtaining an objective cumulative assessment of students' achievements during the entire learning process to build a rating;

- identifying promising candidates for incentive programs, practical training programs, research and social orientation;
- automating the process of obtaining statistical and analytical reports on the results of educational, research, administrative and managerial activities of the university.

The project “Digital University”

Project goal:

- digital transformation of learning and management processes at the university.

Project objectives:

- foundation of virtual webinar rooms for online classes in electronic training courses capable of organizing automatic student assessment for classroom work;
- students’ testing directly in e-learning courses on the test bases of the Unified Testing Portal in the sphere of education;
- creation of mass online courses based on the university, with placement on third-party educational platforms for the organization of online learning, which will attract students from other universities and work more actively within the framework of networking.

Advantages of implementation for the members of the Consortium of Regional Economic Universities:

- monitoring the activity of users (teachers and students) on the Electronic University website, allowing to quickly track the least active users;
- developing the university hardware and software complex for training and certification of personnel in an online environment;
- accompanying training using simulation training equipment.

The project “Unified Student Office”

Project goal:

- creation of a single digital point for processing applications from students to increase satisfaction with the quality of services delivered by an educational organization and eliminate the need for personal presence when forming a request for a service.

Project objectives:

- implementing the “Single Window” principle when a student applies for services through an automated system within the student’s personal account;
- reducing the time of implementation of additional services for students;
- improving the quality of service facility by intensifying and unifying the process of providing services.

Advantages of implementation for the members of the Consortium of Regional Economic Universities:

- monitoring the results of providing services to students in real time in order to take timely response measures;
- tracking the executive discipline of administrative employees within the framework of a single student office;
- automating the process of obtaining statistical and analytical reports on the results of office work.

The project “Smart Library”

Project goals:

- to provide effective library activities through a Radio Frequency Identification (RFID) system;
- to mark the library fund collection with RFID tags and to use special readers making it possible to control the process of book turnover.

Project objective:

- to automate the reception, search, issuance and return, etc. of a book/textbook.

The project “Digital Dean’s Office”

Project goal:

- development and practical application of an integrated interactive environment for the management of educational routes and document support in professional and additional educational programs.

Project objectives:

- creating and testing of a common intellectual environment for managing the university’s activities;
- constructing portals for individual workstations, interactive stands combining documentation activities.

Advantages of implementation for the members of the Consortium of Regional Economic Universities:

- developing and testing of information systems within the framework of a real university;
- scaling of the Digital Dean’s Office project to the city, ministerial and federal levels (Консорциум региональных экономических университетов).

Summing up the outcomes of the study, it should be noted once again that the digital educational environment, ICT and the digital competence of the university teacher are the main components of the digital transformation of education, with the presence of a developed digital educational environment at the university, the presence of teachers who are well-versed in modern ICT and increase the level of formation of their digital competence being the critical conditions for the digital transformation of education.

Conclusion

The digital transformation of education plays a vital role in ensuring high-quality education and equal opportunities for students around the world. The digital transformation of the educational process is a creative interdependent

system of relations between its participants, formed as a result of the development and implementation of modern information technologies and appropriate communication devices in the learning process, the creation of a digital educational environment of the university, the end result of which will be the creation of a digital university model.

To make the process of the digital transformation of education smooth and uninterrupted, educational institutions and governments are developing digital transformation plans and implementing the necessary changes. Faced with a situation of change, traditional universities meet new scenarios, which cause significant difficulties: risks versus opportunities.

Using the example of Samara State University of Economics, it was determined that the digital educational environment of the university is of great importance in the process of the digital transformation of education: the implementation of the digital transformation of higher education largely depends on how developed it is and how it meets the challenges of modernity.

Without detracting from the importance of the digital educational environment of the university, it should be emphasized that much depends on the teachers themselves: how competently they use ICT and increase the level of digital competence, so they will be in demand in the conditions of the digital transformation of education. Thus, changes in the activities of university teachers are necessary if they want to remain competent and meet the new requirements of the digital educational environment.

Although the process of digital transformation in higher education does not always go smoothly, everything indicates that the future belongs to digital education, and those universities that will adjust their mission in the best way, revise their vision and adapt to new realities will receive more significant opportunities in the near future.

The results and conclusions achieved can be used by teachers and administrators in organizing educational process in educational institutions of different types and levels; as well as by specialists professionally engaged in the creation and functioning of the digital educational environment of educational institutions.

Without claiming to be a comprehensive solution to the problem, however, we believe that the article can make a certain contribution to improving the digital transformation of education of a particular educational institution.

Further research prospects may be represented by the study of the features of students' learning in the context of the digital transformation of education.

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