Comfortable digital education: problems and development prospects

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Abstract. Currently, digitalization is rapidly encompassing all spheres of society, including education. This process received particular relevance and a powerful impetus to development in connection with the pandemic in 2020. The educational process has undergone dramatic changes, which has given rise to many problems associated with the insufficient development of the principles of digital didactics, with the unwillingness of universities to provide the necessary conditions for mass online education. The study aims to determine the set of conditions that form the basis of effective and comfortable learning in the modern digital educational environment, to determine the directions for the development of new professional competencies of the teacher. The team of authors considers the readiness of the material and digital infrastructure of the university, as well as the readiness of teachers and students to carry out their functions in the digital environment, to be the main prerequisites for organizing a comfortable and effective education in digital format. The paper discusses the prospects for the development of a multi-tier infrastructure of digital education, the problems that arise among the main actors of educational relations (teachers and students), the direction of the choice of teaching methods, and the organization of classes, taking into account the peculiarities of the distance learning process. The study used methods of comparative analysis, generalization, synthesis. The result and novelty of the research are expressed in the development of a set of necessary conditions for effective and comfortable interaction of participants in the educational process in the context of mass online learning. The results of the work can be used to organize professional development courses and retraining programs for teachers in the field of designing online courses, developing tools for a digital educational environment.

Keywords: digital education, digital competencies, digital educational environment, online education.

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Currently, one can observe an active penetration of digitalization into all spheres of society. We are witnessing a large-scale transformation of information exchange processes and the very forms of information presentation. The opportunities provided by digital resources become the basis for building effective systems of interaction in all areas of human activities. The changes have not spared the education sector either. In Russia, as in the whole world, at the moment such concepts as digital education, digital literacy, digital educational environment have acquired particular relevance.

Digitalization of education is understood as the widespread introduction of methods for collecting, storing, processing, and transmitting information based on computer technology and information transmission facilities into the pedagogical process to develop the intellectual capabilities of students and create conditions that stimulate their interest in cognitive activities [1].

We think that the two main conditions for organizing the most comfortable and effective digital education are the readiness of the material and digital infrastructure, as well as the readiness of teachers and students to carry out their functions in the digital environment.

The infrastructure of digital education is a complex of equipment and software that creates an electronic educational environment, which can be a two-layer phenomenon at the grassroots level (that is, at the level of a separate educational organization). The first, “logistic” layer, provides the educational process from an organizational point of view: accounting for the contingent of students and teachers, their movement, distribution by courses, streams, groups, areas of training, levels of education; accounting, and distribution of teachers’ workload, etc. The second “operational” layer needs an educational environment in which the learning process itself is carried out. This is a unified software environment, or a complex of networked environments that allow the educational process to be carried out in a remote format, to record and control both the work of teachers and educational activities and the results of students. There is a constant exchange of information between these layers. Setting the goal of creating a comfortable digital educational environment all concerned participants in educational relations, such as the administration of an educational institution, teaching staff, students, need to be guided by the principle of maximum possible automatization [2].

If we rise to a higher level than a separate educational organization, the existence of a single digital ecosystem that unites the digital educational environments of subordinate educational organizations and streamlines their information flows would also significantly contribute to increasing the efficiency, speed, and comfort of management and control over education by the relevant authorized organizations and authorities. Within the framework of such an ecosystem, the issues of creating network partnerships, network educational programs that combine the strengths of different organizations can be solved much more quickly and comfortably than it happens offline. Such an ecosystem will open up new perspectives, on the one hand, for education authorities (from the point of view of accounting and control), and on the other hand, for students who will receive wider opportunities for building individual educational trajectories.

The next level should be a unified environment for the educational ecosystems described above. A kind of supersystem that unites and regulates the information flows of ecosystems of all individual levels of education. Such a system will be able to form a general picture of education on a national scale as a whole and provide analytics, tools, and data for making strategic and politically significant decisions. It should be emphasized that a comfortable solution to problems at each of these levels can be achieved through the correct collection of basic, grassroots data, their correct processing, interpretation, and transfer to higher levels with the maximum degree of automation of all processes.

The readiness of the main actors in educational relations (teachers and students) to fulfill their roles in the digital educational environment is the second condition for a successful and comfortable digital education. At the moment, the question of the need to train teachers who have a wide range of professional competencies in the field of information technology and can effectively carry out educational activities in the new realities has arisen. The training of competent highly qualified personnel for the implementation of the learning process in the context of digitalization is a priority direction of the state policy in the field of education [3].

The European model of digital competencies DigCompEdu (Digital Competence of Educators) considers a total of 22 competencies [4], which should be formed in a modern teacher to carry out effective professional activities using the tools of the digital educational environment [5]. 6 directions of their formation have been identified:

- creation of a digital professional educational environment aimed at the implementation of effective professional interaction;
- creation of digital educational resources and the formation of the necessary conditions for their joint use;
- the use of digital tools in the educational process;
- development of strategies for effective assessment based on the use of digital tools;
- using digital tools to expand the educational opportunities of students;
- pedagogical support of the process of developing students' digital competence.

Digital competencies provide the teacher with access to extensive opportunities for using digital educational resources and a variety of information processing tools in all aspects of educational activities and, therefore, creates new conditions for him for professional development and self-improvement [6].

In connection with the 2020 pandemic and the ensuing changes in the educational process at all levels, the education system faced several difficulties in transferring training to a distance-learning format. This happened not only due to the lack of technology or a high-speed connection to the Internet. The importance of questions about the competence and skills of the teacher and the competence of the student was sharply emphasized. Even though the behavior of students can be regulated in the classroom, it is much more difficult to do this through the screen. Working with motivated learners is easy. The difficulties appear when it is required to increase the external and internal motivation of the student. These tasks can be solved using online technologies such as gamification, adaptive learning, individual learning paths, microlearning, and soft skill development. These so-called flexible or soft skills help to adapt to the rapidly changing conditions of the surrounding world and new requirements of professional activity, to find an effective application of the acquired professional skills and abilities [7].

From the point of view of the methodology for organizing online classes, it is necessary to provide students with the opportunity to express themselves from the creative side, to encourage the completion of tasks with their intentions. The group of students in most cases is heterogeneous in terms of the level of training. While some start learning the course from scratch, others already have deeper knowledge and skills. The teacher should entice interest in both the former and the latter from the very first lessons. Creative mini-contests on topics related to the discussed subject, galleries of the best works allow students to be interested not only in receiving high grades, but also provide an opportunity to maximize their creative potential. The work of advanced students complements the teacher's vision and also serves as a guide for beginners. Thus, the emphasis in the organization of online learning is shifting towards principles, methods, and approaches, opening up a transition to a new pedagogical scheme that can be called "design — project — implementation".

In recent years, more and more studies have appeared in which models for overcoming various negative aspects of digital learning (overcoming spatial, temporal, and cultural

barriers in communication) are being formed based on constructive pedagogical technologies [8–10].

Studies of the process of formation of functional literacy in Russia, which are carried out by the Federal State Budget-Funded Research Institution Institute of Education Development Strategy of the Russian Academy of Education, have shown that digital and communicative literacy is the basis for the formation of global competencies [11]. Communication literacy implies the ability to successfully communicate through the use of linguistic means when creating oral and written statements (texts). It is now becoming obvious that not only digital but also communication literacy is based on the ability to use information and communication technologies (ICT). Moreover, the basis for the effective use of digital skills, as well as successful social and professional interaction today is the rethinking of the concept of ICT competencies as broader and multidimensional in comparison with its traditional understanding [12].

The problems of the formation of competencies in the field of ICT among students are discussed in many academic publications [13, 14]. The experience of teaching relevant disciplines shows the effectiveness of using modern computer technologies for the formation of educational content in an e-learning environment together with innovative types of network communication for organizing the learning process in synchronous and asynchronous forms. At the same time, students acquire the necessary skills by completing practical tasks and further consolidate them by completing group projects. The project activities need to be given special attention in the process of creating modern work programs for the formation of the necessary competencies. As practice shows [15], students enjoy working in a team, independently forming the internal organizational structure of their mini-group, helping each other, and stimulating the manifestation of professional qualities necessary for solving the assigned tasks. At the same time, joint work on projects contributes to the development and disclosure of the creative potential of all team members and gives them a feeling of their importance and relevance.

Based on the research conducted, it can be concluded that the following conditions are necessary to ensure effective learning in the digital educational space:

- the comfort and manufacturability of the digital educational environment of the university;
- the willingness of educators to design online courses and work with new tools in a digital environment;
- continuous monitoring of intermediate results of online learning;
- readiness of teachers and students to interact in the new realities of digital education.

The fulfillment of these conditions is the most important factor in the satisfaction of both students and teachers with the process and learning outcomes. Given the scale and importance of the tasks, we consider it necessary to continue research in the field of creating a system for assessing the quality of online courses, as well as in developing methods for the formation of digital competencies and models of effective interaction between participants in the educational process in the digital environment.

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