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## Advantages and Risks of Using the Digital Educational Environment

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### Abstract

The article describes the digitalization stages of secondary and higher education in the Russian Federation and considers the main risks that may be caused by this trend. Among the health risks, there are disorders of the musculoskeletal system, impaired brain development, nervous strain and sleep problems, skin and respiratory diseases. The following communicative risks prevail: the risk of weakening motivation to learn, empathy, leadership skills. The main risks in the field of information security are the risks associated with violation of confidentiality, integrity, accessibility, authenticity and non-repudiation of participants in the educational process.

These negative consequences may become relevant with the widespread introduction of a unified digital educational environment. Their relevance is evidenced by a survey of teachers of secondary, secondary specialized and higher educational institutions of Russia, which was conducted in October-November 2019. It is noted that each type of risk is relevant and can cause negative consequences for participants in the educational process. The work also identified the advantages of digitalization of education, but they do not allow minimizing the identified risks.

Based on the risks identified in the study, the main recommendations were formulated, which, with proper implementation, can avoid the negative impact on participants in the educational process. Such recommendations include, among other things, the use of distance technology for the needs of continuing education and elective classes. If it is necessary to conduct distance learning lessons, use electronic platforms that meet the requirements of integrated security, as well as develop the technology of "safe school Internet".

*Keywords:* digitalization of education, risks of the digital educational environment, information security of students.

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## **Introduction**

The realities of the development of the modern world, the digitalization of all spheres of society, no doubt, have become prerequisites for the introduction of electronic technologies in the field of education. And if at first, the “digit” penetrated the system of higher education, then, the beginning of the third decade of the 21st century was marked by the digitalization of schools as a kind of addition to the traditional model.

## **Literature review**

The priority project in the field of education “Modern Digital Educational Environment in the Russian Federation” was approved by the Government of the Russian Federation on October 25, 2016, as part of the implementation of the state program “Development of Education” for 2013-2020. Presenting the project at the meeting of the Presidium of the Presidential Council on Strategic Development and Priority Projects, Prime Minister Dmitry Medvedev emphasized that creating the digital educational environment is the strategic state task which related to the need to provide the digital economy with qualified personnel (Government of the Russian Federation, 2016). And for their preparation, it is necessary to modernize properly the system of education and training, to bring educational programs in line with the needs of the digital economy, to introduce widely digital tools of educational activity and integrate them into the information environment, to provide the opportunity for citizens to learn according to an individual curriculum throughout their lives - anytime, anywhere.

The priority project “Modern Digital Educational Environment in the Russian Federation” provides the improvement of quality and accessibility of education in Russia through the use of online courses at all levels of education. A rather ambitious task was set - to achieve by 2025 the number of students in educational institutions that had attended online courses for formal and non-formal education - 11 million people, of which students from professional educational organizations and educational institutions of higher education should be 5 million people.

On December 13, 2017, Dmitry Medvedev announced the launch of a new priority project - Digital School. This project involves the creation of a modern and secure digital educational environment that ensures high quality and accessibility of education of all types and levels by 2024, including the transfer of school education "in digital". The website of the national project "Education" says that the target model of the digital educational environment will be introduced in 5 years. It will create digital competency profiles for students, teachers and administrative staff, design and implement individual curricula, including with the

right to set off the results of taking online courses when passing certification activities, automate administrative, managerial and supporting processes; conduct education quality assessment procedures (Government of the Russian Federation, 2017).

The implementation of priority projects in the field of education provides for a number of key areas, the development of which is parallel:

- adoption of legal and regulatory acts aimed at the development of online learning. In particular, fixing the status of online courses as equal parts of educational programs.
- creation of an information resource providing access to online courses on the principle of “one-stop-shop” and combining a number of existing online learning platforms thanks to a unified user authentication system.
- creation of 3,500 online courses in secondary, higher and continuing education programs involving leading developers, from both government agencies and the business community by 2020.
- formation of a system of expert and user assessment of the online courses content quality.
- creation of ten Regional centers of competence in the field of online learning.
- training and education of at least 10,000 teachers and experts in the field of online education.

We focus on the technical component of the project - the so-called digital educational environment, which, according to the “one window” principle, will provide students with educational content at all levels of education. The authors of the project claim that such a system will help students implement the principle of virtual academic mobility in practice, giving them access to quality educational content from leading universities in the country. At the same time, the results of completing the online course will be counted along with the results of full-time studies. The resource will allow teachers to study the best domestic pedagogical experience and will provide an opportunity to devote more time to practical classes with students and to improve their own qualifications. For people seeking to acquire new knowledge or update their skills, it will provide convenient and high-quality service. Employers will be able to directly express their wishes for training content in order to bring it in line with the requirements of the labor market. For educational platforms and creators of online courses, the “one window” resource will provide a unique opportunity to expand the audience, improve the quality of product, and offer a flexible and convenient analytics tool.

As a result of a competitive selection conducted by the Ministry of Education and Science of the Russian Federation, the St. Petersburg National Research University of Information Technologies, Mechanics and Optics (ITMO University) became the executor of the project to create such an information resource (Realization of access to online courses on a one-stop basis, n.d.).

### **Problems of creating a safe educational environment**

The first attempts to digitize schooling began in 2001 with the adoption of the federal target program "Development of a unified educational information environment." It aimed to create a digital educational environment that provides:

- unity of educational space throughout the country;
- improving the quality of education in all regions of Russia;
- preservation, development and effective use of the scientific and pedagogical potential of the country;
- creating conditions for a phased transition to a new level of education based on information technology;
- creation of conditions for the provision of Russian educational services to the Russian-speaking population abroad.

20 years of methodical work on the introduction of technologies in schools allowed re-equipping schools, including rural schools, providing them with access to the Internet, and also providing distance and inclusive education for children with special needs (Vitvitskaya & Studenikina, 2016).

It can be said that the domestic educational system has accumulated impressive experience and comments on the advantages and disadvantages of the global digitalization of Russian education. The introduction of a unified digital educational system in itself gives rise to a number of risks that threaten the safety of participants in educational activities (students, teachers) of various aspects of their life (for example, the threat of weakening social and communication skills, poor physical and psycho-emotional health, etc.). Among other things, there are information risks associated with the information security of the educational process in the digital economy.

### **Purpose and objectives of the study**

In this regard, we set the task to conduct a survey of teachers of schools, colleges, and universities to analyze the likely negative consequences of the implementation of widespread digital learning.

## Methodology

In October-December 2019, a survey of teachers from schools, colleges and universities was conducted, the results of which were statistically processed.

The calculation of a representative sample (PB) is based on a formula that takes into account the level of confidence in the results obtained in the study of the PB, as well as the margin of error:

$$V_{PB} = \frac{\frac{Z^2 \cdot p(1-p)}{e^2}}{1 + \left(\frac{Z^2 \cdot p(1-p)}{e^2 N}\right)} \quad (1)$$

where N is the size of the general population, e is the margin of error in the form of a decimal fraction, Z is the confidence level (Z-score), p is the percentage of the part of the sample of interest to the researcher that showed a certain behavior during previous tests (also as a decimal fraction). In the initial study, the recommended value of p is 0.5.

The margin of error is a percentage value indicating the probability with which the sample views and the views behavior deviate from behavior and general population. The level of confidence indicates how reliable the results are; generally accepted standards used by researchers: 90%, 95% and 99% (in fact, a 95% confidence level means that if you repeat the same study under the same conditions 100 times, 95 times out of 100, the results will be within the margin of error). When determining the sample size, a Z-score of the confidence level – a measure of the standard deviation of a certain fraction from the average value (1.65; 1.96 or 2.58, respectively) – is used (Koichubekov et al., 2014).

The composition of a representative sample is determined on the basis of statistical data and methodological recommendations on the organization of sample observations of the Federal State Statistics Service (Rosstat). According to its data for 2018, in the Russian Federation there are 1.504 million teachers (from schools, colleges, universities) (Malkov, 2019).

## Results

Thus, we calculated the volume of a representative sample, which is equal to 384 respondents. It is this number that was surveyed as a result of the survey.

$$V_{PB} = \frac{\frac{1,96^2 \cdot 0,5(1 - 0,5)}{0,05^2}}{1 + \left(\frac{1,96^2 \cdot 0,5(1 - 0,5)}{0,05^2 * 1711000}\right)} = 384$$

The questionnaire took place in paper and electronic form: paper questionnaires were distributed among teachers of secondary schools in Astrakhan and teachers of Astrakhan State University, an electronic questionnaire implemented in the service Google Forms was posted in a closed pedagogical community on the social network "Vkontakte".

The distribution of respondents by place of work (school, college or university) is shown in Fig. 1.

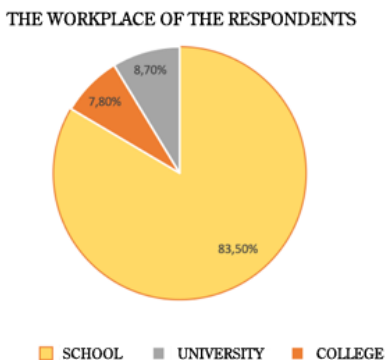


Figure 1 - Distribution of interviewed teachers by place of work

**Risks associated with student health**

The public and especially the parents are most concerned about the risks associated with the health of students. A child’s fragile body is most susceptible to external negative influences, and the harm that could potentially cause long-term contact with technology is still being discussed and studied by the scientific community.

Excessive time spent in front of the computer affects the quality of sleep, worsening it, delaying the moment of falling asleep and shortening sleep hours; screen radiation delays the production of melatonin; content can contribute to physical and psychological arousal, making it difficult to fall asleep. Interactive activities (for example, video games) have a worse effect on sleep than passive pastime (viewing a feed on a social network). Reducing sleep can lead to anxiety, depression, and reduced self-esteem in adolescents.

In addition, reading from a computer screen or reader compared to paper is accompanied by an increase in slow delta activity in the occipital region of the cerebral cortex, as well as maintaining increased CNS activation after reading, which indicates more pronounced fatigue. Prolonged immersion in the digital world causes particular overwork. Many admit that after a few hours on the Web they begin to make mistakes, before leaving the Web they feel empty, tired, irritated.

The degree of fatigue of children in the process of computer training largely depends not only on the duration but also on their content. As a result, a reaction of cerebral overwork develops irritability, tearfulness, touchiness, depression, changes in appetite, disruption of the intestines, restless sleep, and inability to communicate with people, inability to restrain one's emotions.

Information presented on the screen creates difficulties for its visual perception and understanding. The amplitude and frequency of eye movements increase 2.5 times. High brightness of the image causes increased activation of the visual centers, which contributes to a change in brain strategies for processing perceived information, the repetition of which in the process of brain development can lead to impaired maturation of brain structures.

The wrong position behind the workplace is the main reason for the development of diseases of the spine. There are statistics on diseases of the spine affecting the child population, because it is precisely from childhood that problems with the spine begin, which if, without noticing and curing them in time, subsequently lead to serious disorders. Approximately 70% of children have impaired posture, and 10% have scoliosis or lateral curvature of the spine. When working at a computer, we sit in a relaxed position, and it is subsequently forced and not very pleasant. This can lead to impaired posture or curvature of the spine. The most susceptible to this disease are children whose spinal curvature is similar to scoliosis, that is, a curvature of the spinal column to the side.

The human visual system is poorly adapted to viewing images on a monitor screen. The essence of work on a computer is to enter or read texts, draw or study the details of a drawing. And this is a huge strain on the eyes because the image on the display screen is not composed of continuous lines, as on paper, but of individual points, which are also luminous and flickering. As a result, working on a computer seriously overloads our eyes. If, in addition, the monitor is of poor quality and the interface of the programs used is unsuccessful, then the consequences will not be long in coming. The user's vision deteriorates, the eyes begin to watery, a headache, fatigue, double vision appear. This phenomenon is called "computer vision syndrome."

Respiratory diseases that develop due to long-term work with a computer are mainly allergic. This is due to the fact that during a long operation of the computer, the monitor body and the boards in the system unit

heat up and release harmful substances into the air, especially if the computer is new. In addition to the emission of harmful substances, the computer creates an electrostatic field around itself that attracts dust and, accordingly, it settles in your lungs, while a working computer deionizes the environment and reduces air humidity. Each of these factors adversely affects both the lungs and the entire body as a whole (Mocci et al., 2001; Golubinskaya, 2015; Berg et al., 1993).

### Risks of loss of social skills

The risk of children losing social skills is no less concern, because it is the school that acts in the life of the child as a place for constant interaction with society - peers, older and younger in age, because on average, a child spends a quarter of his day behind the school bench (6 lessons, taking into account changes, take about 6 hours). Social skills are multifaceted and comprehensive: the ability to hold subordination, soberly accept criticism, control oneself, understand the mood of another person and smooth out conflicts. The family institution is also at risk: during the period of study at school, adolescents learn to communicate with the opposite sex, and develop skills in gender-role behavior. All these skills may be lost, because electronic space erases the social framework - people of different ages, status and gender communicate in a single field (Sidorenkov, 2003; Razmakhin, 2018).

During the survey, the participants were offered a list of risks associated with social communication. The respondents chose which of the risks they consider relevant when implementing a unified digital educational environment (Fig. 2).

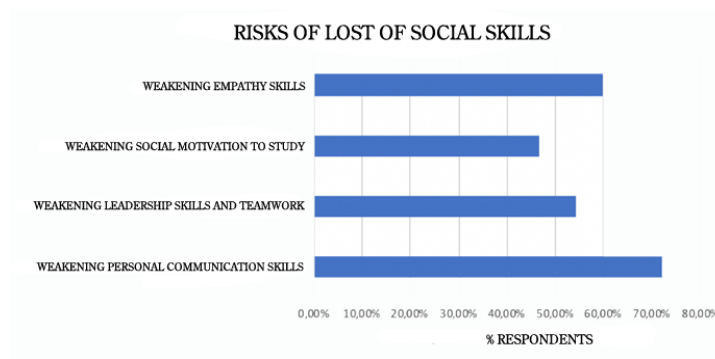


Figure 2 - Survey results on current risks in the field of social communication

Participants were allowed to select several answer options (including all options).



The diagram clearly shows that all of the above risks are relevant and cause concern among respondents; however, the risk of weakening interpersonal communication skills is considered the most dangerous and probable.

### **Informational risks**

Creating a unified digital educational system cannot be considered without an analysis of information risks, because they are generated by the very fact of the educational process in the digital environment. Information risks can be classified as follows:

- 1) Risks of breach of confidentiality. They include the illegitimate dissemination of personal information of participants in the educational process, for example, contact details, photographs, as well as ratings and individual tasks. The latter is also related to copyright compliance and the risks of authenticity. The dissemination of personal data can lead to problems not only in the educational system but also beyond, for example, when intruders can use the personal data of a child to rob or harass.
- 2) The risk of violating the integrity of educational content. It includes violation of the logical integrity of the system, where educational content should be structured taking into account the logic of learning. Integrity violations also include technical errors when transferring data via communication channels and storing data and data mismatch with the standard (for example, educational content mismatching the requirements of the Federal State Educational Standard or other regulatory legal acts).
- 3) The risk of impaired access to the digital educational environment. This risk includes the danger of the inaccessibility of educational content, from the lack of content on a specific topic or subject to the blocking or destruction of the entire educational environment as a whole without providing alternative ways to acquire knowledge (educational monopoly).
- 4) The risk of violation of the authenticity of the information. This risk implies the ability of the subject to impersonate another user. This subject can be both a participant in the educational platform and an external attacker. The result of such activities, for example, can be unauthorized changes in content, fraudulent actions in obtaining an education in order to pass an examination for a student, making changes to a point-rating system, etc.
- 5) Risks of breach of non-repudiation. Risks include the availability of the ability to refuse the fact of the creation, transmission, and receipt of information. An example is the refusal to send an insulting letter or the refusal to deliver a training exam late.

The above risks were suggested to respondents to select the most relevant when implementing a digital educational environment. The survey results are shown in Figure 3.

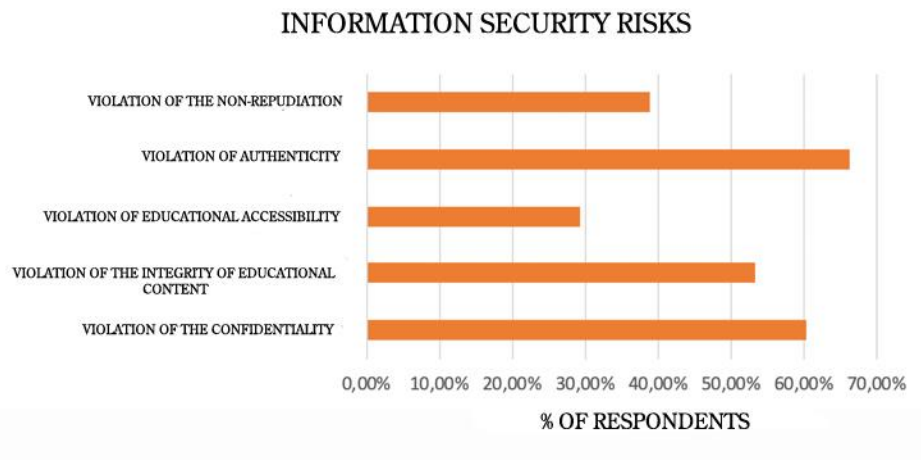


Figure 3 - The results of the survey on current risks in the field of information security

In addition, the interviewed teachers mentioned the risks in the field of copyright, which digitalization of the educational process generates and develops. These risks included:

- an increase in cases of plagiarism among students (copying from another person's network of materials to perform test work, etc.);
- infringement of copyright of teachers on methodological or didactic materials;
- reduction in the amount of unique educational material.

### **The benefits of a digital educational environment**

Despite all of the above risks in various areas of public life, digitalization brings a number of positive aspects of the educational process. The advantages of the digital educational environment include the following aspects:

- 1) Increasing access to education. With the help of the Internet, courses of renowned professors and teachers from anywhere in the world are becoming available, including for students with disabilities. At the same time, there is no reference to the time of training: you can study in your free time.

- 2) Economic benefit. The costs of conducting electronic courses are much lower compared to traditional courses due to the lack of transportation costs, payment of the cost of living in another city, expenses for the organization of the courses (rental of premises for the courses, staff salaries, expenses for the methodological support of courses, handouts), especially if the courses accept a large number of students.
- 3) The possibility of implementing a more flexible individual educational trajectory. An individual training program can be developed for each student, taking into account his mode and need for knowledge. The curriculum can be adapted to the characteristics and needs of all participants in the educational process: from a set of independent training modules, you can create an individual curriculum that will meet individual or group needs. E-learning provides equal educational opportunities regardless of a person's characteristics - health status, place of residence, material security.
- 4) Reducing the complexity and the release of teachers from routine work: checking homework, filling out performance reports, reading the same lecture in several streams, etc. This also includes solving the problem of staff shortages.
- 5) Accustoming to independence. Since the future system implies independent work, a child from childhood will understand that he himself should strive to obtain knowledge. Such education will further make the character of a person more solid. Without excessive guardianship of teachers, the student will achieve better results.

## **Discussion**

Conducting a survey among teachers of schools, colleges and universities made it possible to formulate more accurately the main threats and risks associated with the introduction of digital learning in the educational system of the Russian Federation. In addition, respondents also shared their views on what measures, in their opinion, could minimize the above risks. Such measures include labeling and filtering of age-related content, development of skills for students to filter independently unwanted information. These measures can be implemented in the framework of the "educational Internet" - a kind of white list approved by the state and educational institutions of resources that can be used in the educational process. With all this, it was revealed that 90% of the survey participants believe that digital education will be able to replace the traditional class-lesson system over time, and 64% are convinced that in general, digitalization of education has a positive effect on students due to the above advantages.

In addition, respondents left their opinion about the educational levels at which the use of the digital educational environment is appropriate. Most of the respondents agreed that this model of education is appropriate, starting from grade 10 and ending with additional professional education.

## **Conclusion**

Informatization of education plays an important role in improving the quality and accessibility of education. The introduction of new technologies in the learning process allows, along with traditional teaching materials, to use modern electronic means to support and support the educational process. However, in addition to advantages, there are threats that are caused by the organization of a unified digital educational environment, and they cannot be ignored. When implementing this system, it is necessary to carefully evaluate the consequences of the digitalization of education and adopt an optimal protection strategy against the threats it causes.

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