Distant learning: challenges and risks of 2020

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Abstract. This article presents relevance of distance learning technologies in the current stage of public relations evolution owing to the development level of electronic devices for data transfer, processes of economic integration, the need to “socialize” for people with limited mobility, the need for lifelong learning, and changing conditions of interaction during 2020th pandemic. Based on the analysis of legal as well as organizational and methodological documentation, the available educational experience of general and higher education teachers and our observations, an attempt is made to summarize the challenges of distance learning caused by the imperfection of distance learning regulation, insufficient development of theoretical backgrounds and methodology of distance learning. The mechanism for using ICT technologies in distance learning is also insufficiently developed. This article reveals the decline risks in the quality of education and threats to the health of students in the realization of distance learning. Our own experience in the implementation of distance learning using the “flipped classroom” technology is given.

1. Introduction

For decades and even centuries, an indirect interaction of educational process members has been of interest to the academic community. Educational technologies development of mediated interaction in technological terms went from the transmission of previous generate experience to descendants in oral speech to the use of manuscripts and books as a means of interaction. Later, with the introduction of television and radio, it was via televised lectures and lessons on the radio. Finally, this development was made possible through the interaction technologies implementation via e-mail, forums, chats, video and audio conferences for the transfer of almost any type of data (graphic, textual, visual, audio) between the educational process members located in any part of the globe using the Internet world network.

Integration processes of the global economy have resulted in the need for improved information-sharing. They have become one of the reasons for approach standardization in education in different countries, interaction of educational organizations, and interest of young people in studying outside the country of their residence [1].

Interaction between the student and the teacher at a distance enables to solve the issues of social inequality, providing equal opportunities to various social classes of the population, including grow access to education for people with low incomes, with disabilities, and individuals with special educational needs. In 1969, the world's first distance education university was opened in the UK. It was called as the Open University of Great Britain, because it was available in the question of price and the absence of the need to attend classes often. In Russia, the first higher educational institution
implementing distance learning was the private educational institution of higher education "Modern Humanitarian Academy", which lasted from 1992 to 2017 [2].

Increasing the complexity of technological processes, intellectualization of production field, disappearance of some professions and the emergence of new ones have created the demand for continuous education and self-education as well as lifelong education. For this reason, remote interaction allows us to develop the opportunities created for training and retraining, advanced training of specialists during internal and external study modes [3, 4]. Training, when the interaction of the student and the teacher is realized at a distance, is traditionally called remote one. Foreign (Borje Holmberg, Michael Moore, David Sewart John Daniel и др.) and domestic researchers (V. D. Panachev, E. S. Polat, I. V. Robert, V. P. Tikhomirov, A.V. Khutorskoy, etc.) were involved in the theory and practice of distance education [5, 2]. Since the spring of 2020, distance learning has drawn the attention of education systems at various levels in all countries of our planet without exclusion. This is due to the rather unpleasant epidemiological situation in Russia and in the world as a whole. While in previous years, distance learning was seen as one of the possible forms of interaction in the educational process implementation, for more than six months we have been, in fact, members of an ambitious educational experiment at all levels of education, which consisted in learning via remote interaction between students and teachers.

2. Materials and Methods
The analysis of regulatory and organizational-methodical documentation governing the organization of the educational process in primary and higher education from March to November 2020 was performed [6 – 12]. This article generalises and analyses the accumulated educational experience of teachers of general basic and secondary education, teachers of higher education through surveys, educational supervision, conversations with school teachers, teachers – trainees of advanced training courses, teachers and students of higher education institutions (table 1).

| Indicator                                | Students (persons) | Teachers of the university and schools of the Chelyabinsk region |
|------------------------------------------|--------------------|------------------------------------------------------------------|
| Average age, years                       | South Ural State Agrarian University | School No 13 | 46.7 |
| Number of respondents,                   | 19.6               | 14.3               | 27   |
| persons, Students:                       | 216                | 261                |      |
| - 1st year                               | 109                |                    |      |
| - 2nd year                               | 107                | 27                 |      |
| - 5-6 grade                              |                    | 157                |      |
| - 7-9 grade                              |                    | 77                 |      |
| - 10-11 grade                            |                    |                    |      |
| Sex:                                     |                    |                    |      |
| - female                                 | 130                | 143                | 18   |
| - male                                   | 86                 | 118                | 9    |

The search for data sources and analysis of the issues of organizing distance learning from March to November 2020 in domestic and foreign education was conducted [13 – 29,]. The authors ’ own comments and research are generalized and analyzed [30]. On the basis of the analysis, the challenges of remote interaction in training are revealed. The difficulties and risks of its realization are identified.
3. Results and Discussion

The first challenge is associated with the regulatory and legal rules of distance learning. Let us draw attention to the main documents of the regulatory framework governing the use of distance learning in the educational process. Article 16 of Federal Law No. 273 “On Education in the Russian Federation” as of December 29, 2012 discloses the meaning of the concept of e-learning and distance learning technologies, showing the main provisions of their implementation [6].

The Order No. 816 of the Ministry of Education and Science of the Russian Federation as of August 23, 2017 indicates the procedure for the use of e-learning and distance learning technologies in the implementation of educational programs of higher education. This order includes a wide range of ways to organize training using distance learning technologies: training sessions, practical training, and current performance monitoring during intermediate, final, and (or) state final certification of students [7].

In secondary vocational education, there is a list of fields and specialties of training for which the use of distance learning technologies is not permitted. As for higher education, this data is included in the Federal State Standards of Higher Education. Analysis of educational standards for the directions and specialties of training of the Institute of Veterinary Medicine of the South Ural State Agrarian University showed that for the main educational programs implemented in this educational organization, distance and e-learning might be fully put into practice.

20 March 2020 the Ministry of Education of the Russian Federation issued Orders and guidelines for distance learning during the spread of coronavirus infection, where models of educational programs in the mode of remote interaction of members of the educational process were given [8].

Analyzing the experience of work within the pandemic situation, the authors of the comprehensive interdisciplinary study “Society and the pandemic. Experience and lessons from the fight against COVID-19 in Russia” recognized the lack of regulatory control of distance learning issues, including the organization of educational work” [13, c. 202].

The second challenge is identified by the lack of a common understanding of the essential features of distance education.

The Education Act, adopted in 2012, does not give a clear concept of distance learning, interpreting it as educational technologies “implemented mainly with the use of information and telecommunications networks with indirect (at a distance) interaction between students and teachers” [6, artl. 16]. In 1995, the State Committee of the Russian Federation for Higher Education accepted the "Concept of creating and developing a unified system of distance education in Russia", which defined distance learning as a set of educational services provided using a organized information and educational environment. In 2001, the government of the Russian Federation established the Federal target program " Development of an integrated educational information environment (2001-2005)", which was aimed at the broad use of new generation communication technologies (information and communication technologies) in the educational process of schools of all levels of education: from primary to higher [9]. Today, the development of Russian education is associated with the implementation of the national project “Education”, which involves the creation of a network of digital education centers for children, the organization and performing of online lessons, open lessons “Proctoria”, aiming at early career guidance for children, including through remote interaction [10].

Note that all official documents refer to the status of distance learning as an educational technology, and realize the peculiarity of such technology only in changing the means of communication of members of the educational process. Understanding of the nature of distance learning by scientists-teachers and developers of regulatory documents of the state scale does not correspond. Sufficiently significant research by academic teachers and psychologists in the field of using information technologies to provide remote interaction between teachers and students persuasively show that distance learning is a new form of organizing the educational process with all the features of the methodological system peculiar to it [2, 31].

Without dwelling on detailed theoretical and methodological analysis of distance learning as an educational phenomenon, we will present the main elements of its methodological system, the vision
of which, in our opinion, is realized by the current state of public relations in general and the education system in particular. Implementation of distance learning in crucial situation in the spring of 2020 has made it possible to identify aspects requiring close attention and immediate solutions.

Distance learning is aimed at ensuring interactive cooperation between the members of the educational process through information technologies in all the variety of their modern state.

Educational condition for the success of distance learning and the surety of achieving the goal are of targeted controlled independent work of students.

The second condition for the success of distance learning is students' motivation to reach educational results requiring constant support and backing on the part of teachers and the student's family. In order to achieve sustainable motivation, the student's idea of the planned result as the goal of his own activity should be concrete, operationally structured, and located in the area of his immediate development [16].

Modular design of the educational subject (for the organization of higher education – discipline) enables students to understand their progress from module to module, choose the module at their own discretion or at the instruction of the teacher, learn the content of the modules at an individual rate, depending on the level of training.

The main guidelines for the organization of distance learning, which determined the trend of interaction between teachers and students in spring 2020, were the concepts of permanence, interactivity, accessibility, personalization, adaptivity, flexibility, modularity, efficiency and impartiality.

Experience has proved that distance learning should be organized as much as possible in an interactive mode, creating the opportunity for group learning. Feedback should be immediate or post-operative; it can be deferred, in the form of an external assessment [17, 18].

Distance learning content is determined by educational programs of the appropriate level and direction of training. Planned results of the implementation of these educational programs do not rely on ways in which they will be achieved: remotely, during internal, external, internal-external programs. It guarantees the quality of education.

During distance learning, simultaneous (on-line), asynchronous (off-line) and mixed interaction between the teacher and students was implemented in the following ways of organizing the educational process: remote lessons, video lectures, chat classes, virtual laboratory work, training classes, consultations (individual, group), monitoring classes [19, 20].

It turned out that the range of methods and techniques for organizing training implemented by teachers within the framework of distance learning was quite large. Efforts have been made to summarize this experience in the frame of discussions at online conferences of various levels [21 – 23].

The third challenge. Organisation of practical training of students in distance learning.

Studying scientific subjects in intermediate, natural science disciplines (physics, chemistry, biology and subjects reflecting the integrated content: biological physics, biological chemistry, physical chemistry, etc.) in higher education organizations is indissolubly linked with research, including the study of wildlife [24, 25]. Table 2 gives the features of respondents in the studied disciplines and terms of study.

Table 2. Features of respondents by the studied disciplines, subjects and terms of study.

| Discipline, subject                          | Study term       |
|---------------------------------------------|------------------|
| Biological Physics                          |                  |
| Organic and physical and colloid chemistry  | 1st year         |
| Biological Chemistry                        | 2nd year         |
| Natural Science                             | 5-6 grades       |
| Biology                                     | 7-9 grades       |
|                                             | 10-11 grades     |
Analysis and sampling of existing virtual works, development of own virtual laboratory studies is an essential part of the teacher's activity to provide the quality of practical training of students in the remote mode. It demands significant expenses of teacher's time, relevant engineering and software, teacher's cooperation with technical support services of educational process. While for general and secondary education, such laboratory work is provided by numerous educational platforms, for higher education, such opportunities are rather limited [26].

The experience of distance learning implementation has indicated the appropriateness of using problem-based learning technologies, case technologies, and “Flipped classroom” technologies, in which ICT technologies play as a specific means of interaction between the teacher and the student requiring a particular approach to the development of methodological and didactic support for the organization of practical skills and abilities.

“Flipped classroom”, as an educational technology, has become popular quite recently. However, the main concepts of this method have been known for a long time: partially or completely modern knowledge is submitted for independent development of students, and in the classroom, there is an in-depth study of the discipline, working out practical skills, developing critical and creative thinking of students [27].

It must be noted that the activity of a teacher in "flipped" training has to be aimed, firstly, at motivating students to work independently, showing methods and techniques of its organization: during data search, verification for accuracy, its analysis and critical comprehension, ability and readiness to understand information during learning session. Secondly, the teacher adjusts academic knowledge to the form in which it becomes not just educational knowledge, but educational material accessible for independent study by the level of complexity of the used terminological and mathematical apparatus, modularly structured, providing methodological recommendations for its independent study.

It must be noted that the technology under discussion was used by individual teachers during lectures, when the lecture material was provided on the day before of its reading, to ensure that students came prepared for the comprehension and in-depth study of the most complex elements of the lecture content, the solution of tasks for the application of the acquired knowledge. In this case, at the beginning of the lesson, the lecturer performed a small survey to understand the degree of readiness of students to accept the educational material. In the context of distance learning, such “flipped” lectures should be performed using video conference mode.

At the Department of physics of the Institute of veterinary medicine this educational technology has been used for decades in the laboratory sessions, when theoretical material on the issue under consideration, necessary for experimental work, methods of laboratory research, students take on their own at home, reinforcing the “familiarity” records in specially designed forms for laboratory work on the principle of a workbook. Assimilation level of educational material is checked by the teacher at the beginning of the lesson via control and assessment of filling in forms and a conversation with the student on issues known in advance (questions for self-control). If necessary, correction of filling in forms is performed, clarification of what has been studied. Note that the formation of students' regulatory educational actions plays a decisive role in independent work: goal setting, planning, forecasting, self-control and self-assessment, self-supervision, which, based on the requirements of the Federal State Educational Standard for Secondary General Education, should be totally formed in a school leaver [30].

The classroom work of students includes carrying out a laboratory experiment, during which the previously independently obtained knowledge is deepened and consolidated, experimental research skills are formed, communicative skills are developed through interactive communication of students with each other and the student with the teacher.

Note that the technology of inverted learning is closer to the real professional activity of the graduate and his everyday life. The implementation of this technology requires focusing on the educational process on the development of students' abilities and high professional qualification of the teacher. In the conditions of distance learning, in some cases, it is likely to replace a real experiment.
with a virtual one, for the preparation of didactic support for which the teacher’s knowledge of computer technologies, his skill to work in a team with specialists in the field of computer technology and programming is put to the fore. Efficiency of distance learning is largely defined by the level of qualification of the teacher: his organizational and methodological skills [31].

In the implementation of distance learning in laboratory classes, as in the practical training of students, especially in the study of the characteristics of wildlife objects, the technology “Flipped classroom”, undoubtedly, requires the adaptation of the existing and the creation of a new methodological and didactic support of the educational process.

The fourth challenge. The use of ICT technologies in distance learning. ICT - competence of the teacher, technical and software equipment of the educational process.

Efficiency of interaction was largely provided by the degree of development of didactic materials and their adaptation to remote interaction, that is, the mobility and efficiency of their delivery methods, and feedback effectiveness.

ICT-competent teacher not only uses various information tools, but also designs methods, means and forms of their successful application in teaching activities. In this case, the teacher needs a detailed operational planning of the student's activity and organization: from an accurate statement of the goals and objectives of training to the methods of delivery of the necessary educational materials. The teacher is given the role of an adviser, an organizer of various activities of the student, accompanying in the formation of certain competencies, a supervisor and a curator of works, a manager and a coordinator.

UNESCO (2011) suggested six main components of ICT competence of teachers: understanding the role of ICT in education, curriculum and assessment, educational practices, technical and software tools of ICT, organization and management of the educational process and a professional development. The professional standard of the teacher secured these provisions [32].

The implementation of distance learning in the spring and summer 2020 demonstrated its positive sides: learning at an individual rate, the availability of training and educational materials, mobility, technological efficiency, and flexibility of the educational process [13].

Figure 1 illustrates the challenges of distance learning revealed by our research.

![Image of Figure 1](image_url)

**Figure 1.** Distance learning challenges.

Despite the multiplicity of opportunities provided by distance learning, it is essential to highlight certain challenges in its implementation, which were pointed out by school teachers and university teachers, university students, and school students in our survey:

- lack of direct face-to-face communication between members of the educational process;
- the need for a personal computer and stable access to the Internet;
- high requirements for the setting of the training task and for the management of the process;
‒ training in the remote interaction mode requires tough self-discipline of the student;
‒ the educational outcome directly depends on the student's independence and consciousness;
‒ the teacher is faced with the requirement to create password-protected online events when interacting remotely;
‒ it is necessary to protect the personal data of educational process members;
‒ there are difficulties in authenticating the student during the knowledge checkup;
‒ the complexity of developing educational materials is high for a teacher.

In spring 2020 difficulties of distance learning related to technical challenges (equipping all members of the educational process with personal computers, high-speed Internet access, overloading of educational platforms) were particularly noticeable in the first days of its implementation.

Generally, the existing problems lead to a number of risks of implementing distance learning, among which the risk of reducing the quality of education is in the first place.

Article 2 of the Federal Law "On Education in the Russian Federation" defines the education quality as a complex characteristic of educational activities and training of students, expressing the degree of their conformity with Federal State Educational Standards [6]. Demands for the results of training of university graduates are specified in the Federal Educational Standards of Higher Education by a number of competencies. Each competence formation is related to the learner's assimilation of the amount of knowledge, the formation of methods of activity and experience of their implementation for the purpose of becoming ready for certain types of professional activity. Learning in a remote mode implies interaction between the teacher and the student when checking the absorption of the material. However, the incompleteness of technical means often does not permit to control those who does review work or pass the test. Nowadays, not all educational organizations are fully equipped with methodological tools in electronic form and programs for online monitoring of knowledge to the extent that is required to obtain high-quality control. This causes a decline in the quality of education. [1, 17, 26].

Working with electronic equipment demands observance of safety standards and rules for the health of both students and teachers [11]. At the end of July 2020, the National Medical Research Center for Children's Health at the Russian Academy of Sciences and the Ministry of Health, together with the All-Russian Society for the Development of School and University Medicine and Health, published "Hygienic standards and special requirements for the device, content and modes of work in the digital educational environment in the field of general education" [12]. These standards are of an advisory nature, but their authors express their hope for the introduction of the developed recommendations in the sanitary regulations and standards on e-learning, the release of which is scheduled for 2021 in Russian Agency for Health and Consumer Rights. These guidelines include, for example, the unacceptability of the use of smartphones, wireless Internet connection for educational purposes, and recommendations on the mode of use of electronic devices. The lesson using remote technologies in primary and secondary schools should last 30 minutes, a student of the 11th grade can sit on computer for 150 minutes a day without harm to health. These are five shortened lessons (!) without independent homework. There are no scientifically based guidelines on the use of e-learning for students and teachers of higher education yet. It is essential to be conscious of the risks of distance learning related to the health risk for students with the extensive use of electronic equipment. Disregard of research recommendations can jeopardize national health, result in an increase in diseases of the visual organs, functional abnormalities of mental sphere, nervous, cardiovascular and musculoskeletal systems. There are researches concerning the need for psychological support of students during the compulsory switch to e-learning [28, 29].

Figure 2 presents the possible risks of transferring education to remote mode.
4. Conclusion
Distance learning experience in the spring 2020 conclusively demonstrates its potential and benefits considering the compulsory restriction of direct interaction between the members of the educational process. However, indirect interaction between the teacher and the student needs close attention of both academic teachers and methodologists, as well as organizers and developers of documents providing regulation of all aspects of the educational process.

Analysis of forms, methods and means of performing classes in remote mode indicates that the greatest challenges arise when carrying out classes of natural science orientation, implying practical training of students. Additional focus is needed for the development and improvement of virtual practical and laboratory work, visualization of models of wildlife objects, creation of virtual simulators, including for organizations of medical and veterinary education.

For ensuring the quality of distance learning, implementation of the requirements of educational standards for the training of graduates of all levels of education, it is essential to improve the forms, methods and means of monitoring and evaluating the educational achievements of students, the orientations of the educational process to organize a stable motivation for learning, the development of students' regulatory universal educational actions.

Issues of sanitary and hygienic standards and modes of remote work of both students and teachers need an immediate solution. We should note the fact that if general education is working in this direction, then higher education is left out of the attention of scientists-hygienists, physiologists, and is an area of risk and danger to the members' health of the educational process.

Generally, it is essential to emphasize the positive role of remote interaction for the realisation of the most important human right to education.

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