Intermediate results: how students assess distance learning and whether there are prospects for its application in interactive educational environments

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Abstract. The paper presents the results of the study of the use of services and technologies in distance learning for students. Particular attention is paid to the analysis of the advantages and disadvantages of using distance learning technologies that affect learning outcomes and students' satisfaction with the educational process. The work is relevant to improving the educational process by increasing the effectiveness of distance learning tools and technologies, taking into account their advantages, improving the quality characteristics of the educational process, its elements and the use of optimal technologies for both students and teachers. As part of the preparation of the work, a sociological study of 1,000 university students was conducted, in which the preferences of students in the use of distance learning services, the frequency of their use, the degree of application of such tools by teachers in the educational process were studied. The most popular digital services for distance learning were identified, including the most widely used interactive learning services. Identification of the main negative and positive aspects of distance learning in terms of students. Prospects for the use of digital services in virtual educational environments and meta-universes were shown, as well as the development of electronic didactic means for the implementation of the educational process. The results obtained during the study allow clarifying the attitude of students to distance education, assess the degree of influence of various factors on the effectiveness of distance education. The results can be used to make changes in the current educational process in terms of application or rejection of specific methods and technologies, their adaptation and improvement.

1 Introduction

The national education systems around the world, for the most part, were not prepared for widespread introduction of quarantine, implementation of educational process exclusively in a distance format. [1, 3, 4] Many teachers, trainees, representatives of the administration of

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educational institutions and public officials have not used distance technologies for education before this. [1, 3, 4]

In a short time, educational institutions were forced to use previously available solutions, often without understanding the capabilities and limitations of these solutions, the risks and benefits.

Not all teachers were able to quickly adapt their content to the new conditions. It should be mentioned that the issue of the level of conditions that students should have for effective learning wasn’t risen either.

After some time, it can be stated that not the most part of the educational content in the framework of distance learning is performed at a high quality level.

The above-mentioned reasons retain the relevance of the discussion about the application of distance education on a large scale. In order to ensure the completeness and clarification of the discussed problems, the authors of the article conducted an anonymous survey of ITMO University students in 2022. The survey involved 1,000 undergraduate and graduate students. The results of the survey could complement the previously obtained data of the sociological survey [2] and analyze the dynamics of changes in the assessments, as well as reveal the specifics of the perception of distance learning by the students of technical universities.

2 Results

The student survey clarified what digital interactive educational services were used by university teachers and which of the interactive services were more in demand in the educational process. The results are presented in Fig.1.

![Fig. 1. Degree of usage of digital interactive services in educational process (%).](image)

The leaders among the services for interactive learning were such platforms as: Kahoot - 74%, Online Test Pad - 65%, Quizizz - 45%, Quizlet - 40%.

The functionality of the above services is quite similar and the leadership in use is largely determined by simplicity and ease of use, the breadth of available functions, the availability of free functionality.
In the survey the authors tried to identify the most significant negative and positive aspects of the use of distance learning technologies from the perspective of students at a technical university. Arguments for and against from the point of view of a teacher have already been described by colleagues. [1,3,4] They are partly similar, but also have distinctive features.

3 Negative aspects of distance education

Among the negative aspects, 27% of the surveyed students noted the most negative factor of distance learning as a lack of live communication and communication in different forms of its manifestation: social contact, personal communication, receiving non-verbal information, closer interaction with fellow students, lack of informal communication before and after classes, feeling isolated, reduced communication with instructors, lack of informal contact with the teacher and other students. In comparison with the research "The opinion of Russian university students on forced distance learning"[2] conducted in May-June 2020, the assessment of this factor increased significantly from (19-18%) to 27% in November 2022. Graduates who appeared at the university only several times managed to graduate during the pandemic and quarantines, and most of the students were especially acute about the lack of social contacts and communication.

The second most negative aspect of distance learning was the relaxing home environment. Two main aspects of learning at home can be identified.

The first aspect that can significantly reduce the effectiveness of learning is a difficult or unhealthy family environment, limited personal space, possible interference of family members during learning, destructive relationships, distractions for household chores (21%). A student studying at home may have no personal space, there may be other children in the family, extraneous noises, and other distractions (repairs at the neighbor's house, barking dogs, family members talking, visitors, phone calls, etc.). Similar results were obtained in an earlier study [2] (19.2%) and have not changed much over time, which indicates the existing problems in this aspect and the need to consider this factor when forming an individual educational trajectory or taking online courses.

The second aspect is related to self-discipline, self-management, the level of internal motivation and the lack of external control. Students describe such aspects of homeschooling as: relaxed self-sensation at home, lack of a work atmosphere around, constant distractions for household chores, difficulty in forcing themselves to study at home, reduced concentration on the material, difficulty in maintaining attention, and a great temptation to hide the zoom tab and do their own things (21%). Also, according to the students, the line between personal life and study is blurred, there is a feeling that all the time they are studying, and because of this there is a feeling of fatigue. Some students pay attention to an increase in procrastination (3%), the temptation to do nothing (4%) and laziness (3%).

The study [2] provides data on the reduction of work efficiency 40.3% of respondents. Comparing the results obtained, it can be noted that the students were able to adapt significantly to the distance form of education and the proportion of those experiencing problems with efficiency decreased cumulatively to 27%.

Trainees pay attention to the difficulty of getting feedback, increasing the time of getting it. Some students note that it is more difficult for them to ask the teacher questions (4%). Some of the respondents have anxiety associated with a long stay at the computer, decreased physical activity (4%). Other negative aspects also were mentioned: technical problems with connection, sound and video quality, because of which it is possible to lose the essence of the educational material presented, power outages and disconnection, software failures (6%). In comparison with the study [2], the number of respondents experiencing problems significantly decreased from 24.4%.
The deterioration of the quality of the educational process in the conditions of distance learning according to the respondents is associated with the inability to do practical tasks in real laboratories, for example, in physics, the inability to clarify the material from neighbors, limited feedback, poor-quality teaching materials (6%). Aspects of the prospects of future changes in distance education are also revealed in the works [5,6]. Respondents note that in distant education it is quite easy to lose attention and connection with the material studied, the sense of deadlines is lost, students are more prone to procrastination (8%). Some students point out the long waiting time for feedback from their teachers, ignoring letters and messages, this feature is also characteristic of students when receiving assignments from the teacher. Some learners believe that teachers think they have a lot of time and give them a lot of assignments, which leads to an increased workload.

4 Positive aspects of distance education

Speaking about the positive aspects, 50% of the respondents noted time savings as the main advantage of distance learning. In comparison with the mentioned data of colleagues [2], the assessment of the importance of this aspect increased from 21.7% of respondents. In general, most of the positive aspects noted by the respondents are associated with saving resources: time, energy, and financial costs.

The second largest block of respondents' answers is related to comfort and accessibility (18%), which is very close to the results of our colleagues (18.4%) [2]. If it was noted above that an unfavorable home environment can damage the quality of education, and favorable one can have the opposite effect, as it can increase concentration, help not to be distracted by conversations and the actions of others, reduce the force of negative social pressure in some cases. This side cannot be considered separately from the having comfortable environment, and the level of inner motivation and self-discipline of the student, as well as the quality of the educational content, the interest of its presentation, the complexity of the material and other nuances, each of which can make adjustments to the overall result obtained.

The next advantage, according to respondents, is mobility and accessibility of training from many places, both for students and for speakers (14%). This may have a positive impact on training, as educational institutions are more likely to attract representatives of industrial partners to conduct classes and to participate in the activities of the educational organization. Speakers from large cities, having more experience, can remotely share knowledge with students from other cities and countries. For speakers, in turn, the opportunity to save time and a larger audience coverage can also be valuable.

An important component of distance learning is the ability to go back to the class materials if there is a video recording and listen to it again later at a convenient time. That allows you to learn at a convenient pace, at a convenient time and forms the uniqueness of the educational trajectory. If a learner needs to repeat the material more than once, he has such an opportunity at his convenience. Most of the educational institutions have yet to work on this approach, because most often this aspect was left to the discretion of the teacher and was used quite rarely.

Some respondents also noted such positive aspects of distance learning as the reduction of distractions such as communication with classmates/groupmates, hunger, thirst, etc. Saving travel time can allow students to get a better night's sleep, be more energetic, and have more energy to study, both during the day and after class, which can have an impact on their overall learning outcomes. Some students noted the simplicity of passing the session, this fact can be considered from different points of view. The first side is related to the reduced level of teacher’s control over the possibility of cheating. Another side of this aspect
is the decrease in stress, anxiety, which is detrimental to human health and is often left out of the evaluation of the educational process.

Students noted as a positive side of distance education the possibility of combining it with work. At a time when changes in the economic and technological environment are so rapid, and the educational system does not keep up with the needs of economic agents in obtaining new skills, gaining professional experience becomes a positive factor both for personal self-development of the student, and for the employer who can teach the student the narrow specifics of the company.

At the same time the data of the survey show that the majority of students are not looking for any easier ways of getting education, and want to get quality knowledge, combining the advantages of all forms of education.

Most students (67%) consider the mixed form of education as optimal (Fig. 2), when classes are mainly held in person, but if necessary, there is always the opportunity to attend class remotely or skip it, and to get acquainted with the video recording, presentation and other materials of the class at a more convenient time. In comparison with the data received by researchers earlier [2], this position has strengthened even more (from 59%).

![Which form of education is more convenient for you?](image)

Fig. 2. Which form of learning is more convenient for you.

Most respondents believe that the distance form reduced the quality of education. There are also number of students (two times less) still think that the quality of teaching didn’t decrease. A significant part of respondents found it difficult to answer, because they did not always have the opportunity to compare different forms of education within the same discipline.
5 Prospects for the development of interactive educational environments

There is no exact understanding of what models of distance learning on a new qualitative level can become our future, but there are obvious advantages of immersive technologies and the first experience in the use of interactive educational environments [21-25].

Thus, the University of Tokyo (Todai) has started to implement some educational programs in the meta-universe. The project is implemented by the Faculty of Engineering and the Graduate School related to engineering. A course in the meta-universe is planned to be open to all comers, both high school students and adults. Through the use of the meta-universe developers want to eliminate the problems of access to high quality education in engineering and computer science for all comers [7].

China has announced a two-year plan for the development of meta-universes for 2022-2024. The plan should stimulate the development of the Web3.0 Internet and focuses on promoting the development of sectors related to metacities as well as the management of a smart city for the digital economy. [8] Through the implementation of this plan, China is trying to promote digital education scenarios, strengthen cooperation between technology companies and educational institutions, expand interactive online education models, and develop new digital pedagogical platforms. The Metaworld Action Plan has also been a push to provide all kinds of support for the development of virtual reality in districts and municipalities.

For example, the University of Hong Kong (Hong Kong University of Science and Technology) began to hold classes in virtual classrooms and planned to launch a campus in the meta-classroom [9]. Russia has also launched several educational projects related to the meta-universes. At the annual conference "Digital Industry of Industrial Russia" in Nizhny Novgorod a prototype of the country's first educational meta-universe Neumark.MetaVerse was presented, created by the Artificial Intelligence Center Gorky together with the Nizhny Novgorod Region Development Strategy Project Office and the AVM Technologies IT

6 Conclusion

The prospect of introducing new digital technologies into the educational process offers a number of positive opportunities for improving the educational system and distance education. There is a significant part of business processes in the educational field that will be automated with the help of RPA technologies and AI algorithms. There are great prospects for improving the quality of distance education, scaling the best educational practices, and the use of virtual educational environments. Such game ecosystems as Roblox allow implement gamification of the learning process and feel the benefits of a virtual environment, but they still have limited functionality compared to the meta universe. Environments such as Minecraft, Roblox, or Fortnite are tied to the game style and can be unnecessarily distracting. Nevertheless, this has not stopped some innovative teachers from delivering their educational courses in these environments. The use of various digital technologies can carry not only positive moments, but also a number of significant risks. In the case of virtual learning environments, these may include limitations related to the use of headsets by students with sensory disabilities. Headsets have a number of disadvantages, their use for a long time can lead to dizziness, headaches, eye fatigue and a number of other negative consequences. At the same time, if the headsets are used not only for educational purposes but also for entertainment, the duration of use can be excessive. The main obstacle limiting the spread of virtual reality headsets remains their high cost, despite the significant reduction in prices in recent years.

References

7. The Asahi Shimbun newspaper. URL: https://www.asahi.com/ajw/articles/14677709


12. G.Y. Vyatkina, Application of innovative educational technologies as a necessary condition for improving the quality of teaching, Problems of Modern Agrarian Science (Krasnoyarsk GAU, Krasnoyarsk, 2020)


15. A.S. Hattie John, Visible learning. A synthesis of the results of more than 50,000 studies reaching more than 80 million schoolchildren (National Education, Moscow, 2017) URL: https://visible-learning.org/hattie-ranking-influences-effect-sizes-learning-achievement/


17. E. Loshkareva et al, Skills of the future. What you need to know and be able to do in the new complex world (Report, Moscow, 2017) URL: https://futuref.org/futureskills_ru


23. N. Grechushkina, Higher education in Russia 30(4), 120-130 (2021) https://doi.org/10.31992/0869-3617-2021-30-4-120-130