Students in the digital format of the educational process of the higher educational institution: risks and advantages

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Abstract. The article presents the goal and tasks of the pilot study and the methodology for processing the results in the aspect of studying the attitude of students to digital formats in education, on the example of implementing the elements of hybrid technologies in the modular structure of studying the course of higher mathematics at a technical university. The obtained results are characterized from the standpoint of identifying the readiness of students to use elements of digital technologies in educational activities using the example of online testing and remote learning in the context of the COVID-19 pandemic. The analysis of the results of a pilot social and pedagogical study using the Likert methodology and their comparison with similar studies is presented. The importance of understanding motivation and taking into account the incentives, risks and problems of modern students in relation to the digital aspects of learning for the further development of pedagogical science in the field of higher education has been updated. The obtained author's results can serve as a basis for comparison and research in the field of pedagogy and psychology of higher education, as a tool to support pedagogical innovations, improve the educational process and the quality of specialist training.

1. Introduction
In connection with the dynamic development and use of IT technologies, such concepts related to educational activities as "digital education", "online pedagogy", "digital sciences", etc. arise and are defined. The digital platform is increasingly spreading in the educational space, which entails a change in the essence of the educational process. The material base that ensures the development of a digital educational environment is the rapid development of the production of individual digital devices. The technological base is the ability to operate with various entities represented in digital form. Prospects for the development of both the first and the second components allow talking about the transition to "hybrid technologies" in the educational space of higher education more substantively.

The concept of "hybrid education" appeared in international studies devoted to e-learning technologies in large corporate personnel retraining centres. The results of using hybrid education methods in higher education were first published in the monograph of C. Bonk and C. Graham [1]. The authors summarized the experience gained and proposed a definition for the new term. "Hybrid technologies’ – learning systems that combine face to face interaction and information and computer techniques and tools." However, the new term and various hybridization models "take root" in Russian educational institutions in a complicated way.

The format of the pilot educational study is designed to obtain new information. In work carried out, aspects of students' attitude to hybrid methods were studied with the aim of further development of the theory and practice of higher education pedagogy. This information was updated during the COVID-19 pandemic. The forced sudden moving away from the contact form of education predetermined the
emergence of new dangers and risks in the educational process. An analysis of the relationships and risks of the interacting parties on the transformation of the higher education system in the digital environment creates the basis for adjusting advanced training and retraining programs for teaching personnel.

Certain aspects of this area of research were considered in the works of I.N. Semenov, N.V. Kurkan, I. Yu. Mishota, A. A. Bazhaeva, T.A. Dvornikova, G.M. Kwon et al. At a seminar on digitalization in higher education held by the Higher School of Economics, it was noted as follows: "digital technologies have become a part of pedagogical approaches; however, students are cautious about the transition to an online learning format" [2]. An analysis of information sources showed that "there is a conscious or unconscious resistance to the digitalization of education among a significant part of the country's teaching staff, especially among teachers of the older generation" [3].

The problematic issues determined the goal of the pilot study – to study the attitude of students of higher educational institutions to digital formats in education by using the example of the implementation of elements of hybrid technologies in the modular structure of studying the course of higher mathematics at a technical university. The tasks and methods of the pilot study were as follows: selective interviewing of junior students; analysis of the results of the snap poll; processing empirical data using the classical Likert scale to identify consistent trends in comparison with the results of similar studies.

2. Justification of the pilot study and its methodology

The attractive side of hybrid technologies is the possibility of an integrated combination of classical and innovative methods, where the individual route of the student's advancement in the process of mastering the educational program is naturally built. The most implemented element is control in the LMS Moodle learning management system carried out by teachers and/or quality management structures during monitoring examinations. In its implementation, both objective and subjective factors appear. Not every teacher has the appropriate personal qualities and the necessary competencies to fulfil the role of the organizer of the student's digital educational space, his mentor and guide in the development of new knowledge and possessions. Areas, forms and volumes of mixing of traditional and innovative pedagogy are not obvious in every academic discipline. At the same time, students also have different motives for learning, level of training, incentives and readiness for self-organization and self-development.

According to the definition of V.I. Zvyaginskiy, "Methodology of pedagogy is the teaching about pedagogical knowledge and the process of obtaining it" [4]. The sociological and pedagogical study is an organized process, in which practical knowledge and theoretical conclusions about the influence of social, psychological and pedagogical factors and influences on the personality take place. The analysis of publications on the methods of conducting sociological and pedagogical study determined the choice of the Likert scale. Along with the simplicity of composition, it allows obtaining a quantitative measure that displays serial data [5]. According to the method of using the Likert scale, the poll participants are presented with statements: scale points that require value judgment in the range from 1 – disagree entirely up to 5 – agree entirely. It is acknowledged that the higher the value given by the respondent is, the more the measured quality manifests itself. A feature of the scale that uses ordinal variables is the method for determining the average trend by the median. The study of students' opinions on the online learning format was implemented in the initial period of the COVID19 pandemic, in the form of a snap poll. The application of innovative methods of current control and preparation for it when studying a course in higher mathematics is emphasized. After two months of implementation of online education, selective (at the request of students) interviewing was carried out.

3. The results of statistical processing of empirical data

Online testing in the electronic educational information environment (EEIE) of the higher educational institution was chosen as a pedagogical influence on the studied sample, as a method of controlling the current level of knowledge, skills and possessions accompanying the formation of competencies. The correction of the selected influence was the conversion of lectures and practical classes into the online
format due to the pandemic. In the existing version of education, second-year students, upon completion of each module of the discipline "higher mathematics", performed test tasks in the classroom for one double-class in writing. It was required to provide a complete solution or justification for each task. The format of tasks and their detailing by the levels of "to know", "to be able", "to possess" is given in the author's article [6]. The minimum performance threshold is set at 60% and corresponds to the first level of training [7]. Students who did not score the threshold value or those who wanted to improve the result carried out the test again online outside the classroom at the time they choose by themselves. Softer test execution conditions imply higher thresholds. The first level of training in online mode is set from 65% to 75%, the second – up to 85%, the third – up to 95%, the highest fourth level of training corresponds to 95% and above. In the first lesson, first-year students got acquainted with the rules of current control and preparation for it. The test opens for one day, and students independently choose a convenient period for its completion of 90 minutes. If the threshold score is not reached, the access to the test is reopened after a week but the time frame is reduced to 70 minutes. The final protocols of the passed tests for the student (by personal password) are available immediately after the completion of the test. The teacher has access to all the final protocols for the analysis of typical errors and reflection.

In the course of the pilot study, a snap poll was conducted for second-year students after testing in different forms for three semesters, and first-year students – at the end of the first semester. The sample of the first year was 54 people, the sample of the second year was 37 people. The research [8] served as the basis for composing the Likert scale.

The empirical data translated into the numerical format of the medians obtained based on individual assessments for the judgments made for each group of students (bachelors and specialists) are presented in table 1.

| Group       | Judgement 1 | Judgement 2 | Judgement 3 | Judgement 4 | Judgement 5 |
|-------------|-------------|-------------|-------------|-------------|-------------|
| 1st year    |             |             |             |             |             |
| Specialists | 4           | 4           | 4           | 3           | 1           |
| Bachelors 1 | 5           | 4           | 4           | 5           | 2           |
| Bachelors 2 | 5           | 4           | 4           | 4           | 2           |
| 2nd year    |             |             |             |             |             |
| Specialists | 4           | 4           | 3           | 3           | 1           |
| Bachelors 1 | 4           | 3           | 3           | 3           | 1           |
| Bachelors 2 | 4           | 3           | 3           | 2           | 1           |
| Bachelors 3 | 3           | 4           | 3           | 3           | 3           |

First-year students showed practical unanimity on the first three judgments, which indicates their formal acceptance of digital formats. The predominant grades of simply "agree" by recent students on position No. 4 can be explained by their successful experience of using the Internet. However, their short experience of being in the environment of the higher educational institution does not allow them realizing that superficial knowledge (or compilation) does not provide a basis for professional competencies. This conclusion is indirectly confirmed by the assessments of this judgment by the
second-year students who showed practical unanimity by giving a score of "1". The experience they gained reflects the opinion of the majority of teachers that digital technologies are a tool, assistant, coach, tutor but not a replacement for the teacher, his personal component in subject-subject educational relations in no way. In all, second-year students showed both great homogeneity and sufficient restraint in their grades. Let's stop at the last table row (Bachelors 3). Students in this group had no experience of either written or electronic testing, as they studied with another teacher. In the first semester of the second year, they encountered modular control in a test mode for the first time while studying higher mathematics. The peculiarity of working with this group was reflected in their practically neutral assessments for all statements.

Selective interviewing in the midst of the COVID19 pandemic was focused on three areas: the advantages, disadvantages and risks of the online format. Thirty-seven first and second-year students, including international students, responded. The answers were presented in free format and related not only to the study of mathematics.

The free mode was noted as the obvious advantage in the overwhelming majority. Here are the typical student responses about the positive aspects of the online format:

- the speed and time of learning is set by the students themselves, which is very convenient;
- there is no need to spend money in order to get to the place of study;
- it allows spending more time with loved ones and pay attention to housework;
- it is the opportunity to learn how to use the computer more efficiently;
- it allows gaining knowledge in the most pleasant environment.

Summing the above and similar statements, let us note that students see the advantages mainly in organizational and psychological comfort.

Among the disadvantageous features, four groups are clearly distinguished. The first group, which reflects the subject-subject relationship, manifests itself in the statements:

- there is not enough personal communication with the teacher;
- if problems arise, the teacher does not immediately respond to the message, it is necessary to wait, there is no time to hand over the task on time;
- impersonal knowledge transfer is less effective;
- it is more difficult to master the material in some subjects without a live lecture by the teacher.

The second group includes technological difficulties. The second group includes technological factors such as incorrect operation of sites, which complicates the process of performing and providing tasks; the problem is to send a task, and the Internet is very bad; sites and platforms provide different information, and it seems that the answers to some questions cannot be found at all. The third group unites problems in disciplines containing laboratory practice. It is characterized by the statements of foreign students: "Distance education is difficult for us; we cannot ask questions directly in virtual laboratories, where we do not understand everything. We answer questions about lab tasks without much understanding. It is easier for mathematics because mathematics is a universal subject; we watch videos in English to understand, but it is quite difficult for most online subjects." Russian students also join them: "Lack of practical skills. Online training in a speciality involving a large number of practical and laboratory classes is difficult. Even the most modern simulators cannot replace live practice." The fourth group characterizes personal characteristics. The process of completing the task by a student may begin not with studying theory but with searching for an answer to the task on the Internet. Not all educational material is understood. In their answers, students note containing self-criticism: poor self-control; a little incentive for self-study; a home atmosphere negatively affects performance; willpower, responsibility, choosing the right pace without outside control are needed. And there is just a cry from the student's heart: "and the main problem is LAZINESS!"
The risks of a complete switching to the online format at the higher educational institution include the options of the answer.

- Lack of the possibility of immediate application of the knowledge gained followed by a discussion of emerging issues with the teacher and clarification of the situation with specific examples. Education should contain live communication, including between students within the group (it is easier to explain something to each other, see an example of carrying out the task, etc.).
- The understanding of the theory is far from high. The ability to copy, perform a task without understanding the material well, the essence; as a result, the bias of self-assessment and knowledge assessment.
- Delay in completing tasks entails missing work and, as it accumulates, students will drop out their education.
- Due to little control and low self-discipline, many students took the situation during the pandemic as a time for rest.
- Students go outside less often; they are sedentary; this can negatively affect health. The daily visual workload increases.
- The possibility that personal data will be entered on unverified sites, both students' and teachers'.
- A threat to the traditional higher education system, especially to full-time education in the higher educational institution.
- Insufficient methodological and technological preparation of teachers and students for the online educational format.

It is impossible to ignore an exclusively emotional response to the topic under study: "I, for one, do not want to study online." These words and a complete analysis of the answers confirm the relevance of the problems raised once again. The modern generation of students are interested but restrained in the introduction of digital elements into the educational process, leaving a significant role for "live" communication with the teacher. The global experience gained in the forced introduction of online education actualizes the requirements for the teaching staff in matters of creativity, reflection and variability in the choice of pedagogical ways and forms of subject-subject interaction. In addition, high technical equipment is needed both in higher educational institutions and among students for sustainable access to the Internet.

4. Conclusions and recommendations
The pilot study found that for the widespread introduction of modern digital technologies in higher educational institutions as a tool for the implementation and support of pedagogical innovations, and for the improvement of the educational process, a pedagogical theory adequate to the problem, practical developments and psychological recommendations are required. Of course, the sample size in the pilot study does not allow statistically significant substantiation of trends in education with digital elements. But the data obtained are consistent with both the expert opinion expressed at the seminar at the Higher School of Economics [2], and with the conclusions of the study conducted at the Kazan National Research Technical University named after A. N. Tupolev [8]. The importance of understanding the motivation, incentives, risks and problems of modern students in relation to digital aspects in education is confirmed by the need for higher education to enter the new digital reality.

References
[1] Bonk C J and Graham C R 2006 The Handbook of Blended Learning Environments: Global Perspectives, Local, Designs (San Francisco, CA, US: Jossey-Bass)
[2] Digitalization of Education: future challenges for politics and law https://ioe.hse.ru/lawworks/news/228460310.html, last accessed 17.08.2020
[3] Verbitskiy A A 2019 Digital education: problems, risks and prospects Electronic scientific
journal "Homo Cyberus" 1(6) http://journal.homocyberus.ru/Verbitskiy_AA_1_2019, last accessed 19.08.2020

[4] Zvyaginskiy V I 1982 Methodology and Technique of Didactic Study (Moscow, USSR: Pedagogika)

[5] Wright B D and Masters G N 1982 Rating Scale Analysis (San Diego, CA, US: MESA Press)

[6] Borisova E V 2017 Elements of technology for building high-stakes tests in the course of higher mathematics International scientific research journal 11-2(65) 82-5

[7] Simonov V P 1999 Diagnostics of the degree of training of students: Training and reference guide (Moscow, Russia: MRA)

[8] Kwon G M and Wax V B 2018 The use of the Likert scale in the study of motivational factors of students Scientific and methodological electronic journal “Concept”11 1039-51