

DISTANCE EDUCATIONAL TECHNOLOGIES IN TEACHING MATHEMATICAL DISCIPLINES TO STUDENTS OF PEDAGOGICAL UNIVERSITIES

TECNOLOGIAS DE EDUCAÇÃO A DISTÂNCIA NO ENSINO DE DISCIPLINAS MATEMÁTICAS PARA ALUNOS DE UNIVERSIDADES PEDAGÓGICAS

TECNOLOGÍAS EDUCATIVAS A DISTANCIA EN LA ENSEÑANZA DE DISCIPLINAS MATEMÁTICAS A ESTUDIANTES DE UNIVERSIDADES PEDAGÓGICAS

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ABSTRACT: The global pandemic of 2020 and 2021 was a turning point for the higher education system. Higher educational institutions should be ready to switch to a distance learning format at any time. This article attempts to discuss the problems that arise in teaching mathematics to students of a pedagogical university when introducing distance educational technologies and recommendations for solving these problems. To that end, a survey was performed at the College of Physics and Mathematics of the Mordovian State Pedagogical University. The research process comprises theoretical methods (studying and analyzing scientific, methodological, and educational literature). As a result, the analysis of modern distance educational technologies for students' communication with a teacher is presented and the problems of transition from traditional to distance learning are identified. Some recommendations on health care in the distance learning format of mathematical disciplines are highlighted.

KEYWORDS: Distance learning. Traditional learning. Electronic educational resources. Educational platforms.

RESUMO: *A pandemia global de 2020 e 2021 foi um ponto de inflexão para o sistema de ensino superior. As instituições de ensino superior devem estar prontas para mudar para o formato de ensino a distância a qualquer momento. Este artigo tenta discutir os problemas que surgem no ensino de matemática para alunos de uma universidade pedagógica ao introduzir*

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tecnologias de educação a distância e recomendações para a solução desses problemas. Para o efeito, foi realizado um inquérito na Faculdade de Física e Matemática da Universidade Pedagógica do Estado de Mordóvia. O processo de pesquisa compreende métodos teóricos (estudo e análise de literatura científica, metodológica e educacional). Como resultado, é apresentada a análise das modernas tecnologias de educação a distância para a comunicação dos alunos com o professor e são identificados os problemas de transição do ensino tradicional para o ensino a distância. Destacam-se algumas recomendações sobre a assistência à saúde no formato de ensino a distância das disciplinas matemáticas.

PALAVRAS-CHAVE: Ensino a distância. Ensino tradicional. Recursos educacionais eletrônicos. Plataformas educacionais.

RESUMEN: La pandemia mundial de 2020 y 2021 fue un punto de inflexión para el sistema de educación superior. Las instituciones de educación superior deben estar preparadas para cambiar a un formato de educación a distancia en cualquier momento. Este artículo intenta discutir los problemas que surgen en la enseñanza de las matemáticas a estudiantes de una universidad pedagógica al introducir tecnologías de educación a distancia y recomendaciones para resolver estos problemas. Para ello, se realizó una encuesta en la Facultad de Física y Matemáticas de la Universidad Pedagógica Estatal de Mordovia. El proceso de investigación comprende métodos teóricos (estudio y análisis de la literatura científica, metodológica y educativa). Como resultado, se presenta el análisis de las tecnologías modernas de educación a distancia para la comunicación de los estudiantes con un docente y se identifican los problemas de transición de la educación tradicional a la educación a distancia. Se destacan algunas recomendaciones sobre el cuidado de la salud en el formato de aprendizaje a distancia de las disciplinas matemáticas.

PALABRAS CLAVE: Aprendizaje a distancia. Aprendizaje tradicional. Recursos educativos electrónicos. Plataformas educativas.

Introduction

The educational process should not lose its effectiveness and should not stop. In the current situation, the distance form has become the only way out, in addition to completely stopping the educational process or transferring it to another time. Thus, the problem of organizing distance learning in higher educational institutions and at the same time improving the efficiency of the educational process (KURUCAY; INAN, 2017) is relevant. In connection with the sudden transition to the remote format, we conducted a study of these phenomena that occurred during this transition.

The paper (SARVANOVA *et al.*, 2021) reveals the role of modern educational technologies in the formation of methodological competence of students of mathematical profiles-future teachers of mathematics. Distance learning technologies are also part of modern educational technologies.

This study (SHUKSHINA *et al.*, 2020) examines the practice-oriented training of a future teacher using the Moodle distance learning system.

The purpose of the study is to identify problems that arise in the process of teaching mathematical disciplines to students of a pedagogical university when introducing distance educational technologies, and recommendations for solving these problems.

Research objectives:

- analyze modern distance learning technologies for students' communication with the teacher;
- to find out the readiness of students and teachers to switch to a distance learning format;
- identify the problems of transition from traditional to distance learning;
- to highlight some recommendations for health care in the distance learning format of mathematical disciplines.

Materials and methods

To study the features of the use of distance educational technologies in teaching students, to determine their effectiveness, the study was conducted at the College of Physics and Mathematics of the Mordovian State Pedagogical University named after M. E. Evseyev. The research process involved theoretical methods (the study and analysis of scientific and methodological, educational literature). Empirical methods were also used – monitoring the educational activities of students, the professional activities of teachers, surveys of the specified contingent were conducted. The study was based on the data obtained by the authors as a result of testing the developed methods and means of teaching students of the College of Physics and Mathematics at lectures and practical classes during distance learning.

The materials of the article can be used by teachers of methodological disciplines of pedagogical universities, have practical significance, will allow to realize the professional orientation of training.

Results and discussions

Currently, much attention is paid to the development of educational platforms and electronic educational resources (EOR) that can be implemented in the distance learning format (GONCHAROVA, 2019; BABAYAN; VEZIROV, 2016). This form of training has its pros

and cons (BRINDLEY *et al.*, 2009):

Positive:

- in the process of studying the educational material, you can pay more attention to the most important and difficult to master disciplines;
- independent formation of the schedule of classes: the optimal distribution of time between classroom and independent work;
- free movement for the student without linking him to the academic building and the mode of the day.

Negative:

- distance learning increases the time spent working at the computer;
- distance learning requires the activation of the student's independent work.

More attention is paid to the development of educational platforms and ESM that can be implemented in the distance educational process for schoolchildren. Less attention is paid to this issue for distance learning of students.

University teachers are active users of the Internet, they maintain their pages in social networks, many have their own websites. If a student chooses a distance learning format for himself (at the moment this applies to correspondence and full-time distance learning), then in this case it should be said about the readiness of the student to interact in this format. If we consider the real situation, not all students studying in absentia are ready for remote interaction. For those students who master the educational program in full-time format, the abrupt transition to distance learning also causes several difficulties, both in psychological and methodological aspects. First of all, students expect to have direct contact with the teacher, as it was carried out in the traditional mode. Secondly, each teacher acts as a digital curator and must provide each student with the necessary information, educational and methodological literature in digital format for their discipline. At the same time, each teacher should create conditions for interactive interaction with students, so that students actively interact with him. Third, distance learning should have the property of universality for those cases when it becomes impossible or causes difficulties to use a particular educational platform. Fourth, all the requirements that are imposed on the effectiveness of the educational process: a friendly atmosphere, a situation of success, constant monitoring of activities, transparency of requirements for results, focus on research activities (NGUYEN *et al.*, 2014) should not be violated during distance learning. And fifth, health-saving technologies should be considered when using the remote format. Thus, the problem that arises at this stage is the contradiction between traditional and distance learning forms. All of the above are also relevant to mathematical disciplines, which, along with general

characteristics, also have specific properties related to the content.

As a result of the analysis, the following aspects of students' unavailability for distance learning can be identified:

1. Independent work. Often students have to study the material independently, as they leave the tasks at the last moment, which greatly affects the qualitative and quantitative assessments of academic performance.

2. Lack of interactivity. If the teacher presented his course of video lectures to the students, then the student may have questions, when listening, to which he wants to get answers at the moment, and not after a while.

3. The quality of communication. Many students, especially those living in rural areas, have difficulties connecting to online classes and interacting with the teacher. This aspect may be associated with expensive Internet, poor communication signal, outdated equipment, un-updated software etc.

4. Not all students are honest enough and independently perform tasks. They do not understand that it is they who should master professional competencies, and not only get a sufficiently high mark. It is very difficult for a teacher to check the independence of performing tasks by a student in a distance learning format. If students consciously approach their education, the quality of assimilation and independence in studying the material differs significantly in distance learning, in contrast to the traditional form (CHEN *et al.*, 2008).

All of the above are not aspects of the rejection of the distance learning format, but they should be taken into account when switching to this form, and the ways of interaction with students should be improved. What are the ways to solve these problems? Students and teachers should constantly take courses on ICT competence, since for several decades this quality has been an integral part of the sphere of human activity.

Next, we will consider the phenomena that occur during the distance learning format and negatively affect the physical and psychological health of the student.

1. Some students do not put their appearance in order. If this phenomenon occurs for a long period, then a person ceases to understand how it is permissible to look in society. For example, we can cite that some students send photos with completed tasks, even without framing, household items on the table that are nearby, which have nothing to do with the educational process.

2. Many students noted that the number of bad habits has increased. So, if a student is present at a full-time lesson, he does not have the opportunity to eat and drink, which cannot be controlled at a remote lesson. Thus, the harm caused to the body increases.

3. Modern classrooms are equipped with all sanitary and hygienic and ergonomic requirements. In particular, there are classrooms that are intended for students with disabilities. With a distance learning format, a student can study in unsuitable conditions for him, which in the future can lead to a deterioration of physical health.

4. The state of inactivity increases.

Next, we will consider the main aspects of teachers' readiness for remote interaction with students and the difficulties that arise in this case.

1. Distance learning for people with disabilities already has its own developments, but most often these are isolated cases and not all teachers are ready for this (ZEMSH, 2018). At the moment, distance learning technologies are being actively introduced in higher educational institutions. Most teachers, even with extensive work experience, are not always ready to accept this format of training. This is due to the fact that for several years they have been working out their approach to training and implementing author's methods, primarily relying on direct interaction with students.

2. The distance learning format is a very time-consuming process for teachers, which requires a huge expenditure of the teacher's time. It is necessary to create educational materials in a digital format, post them, and control how the process of assimilation by students takes place. It would seem that we have been working with test simulators, electronic textbooks, surveys for a long time and the time spent on monitoring should decrease. But this does not happen, because the control of mathematical disciplines has its own characteristics. Very often, the answers are assumed not only in the test form, but also in the form of proofs of various theorems. In this case, it is not the result obtained that will be important, but how the student performs the process of proving the statement that is formulated in the task. The teacher should evaluate the completeness, consistency and sufficiency of the proof. In this case, it is better to give this type of tasks in a remote format with the possibility of attaching a detailed answer in written or printed forms in the form of a file. The same form should be used to record the answer to problems with a detailed answer, since it can have different solutions.

3. It is difficult for a teacher to implement an educational function in the process of distance learning (NOGUERA *et al.*, 2018). A person needs to socialize in society, but with the development of the Internet, many people have problems with direct communication. Since when live communication is completely replaced by indirect communication, psychological problems may arise for students.

4. If the transition to distance learning is carried out in the shortest possible time, then there may be a problem of full-fledged implementation of educational programs. Students and

teachers have to spend much more time at the computer than is required by standards. Especially when studying mathematical disciplines, it is necessary to work with the formula editor, study programs for constructing geometric objects and drawings etc. Therefore, a special role should be given to the formation of competencies in the field of health-saving technologies for future teachers (JUWAH, 2006).

A large number of researchers have proven that care with health questions helps students overcome anxiety, tremor, and in turn positively affect other important indicators (MONEY; DEAN, 2019). In the scientific literature, a huge number of studies are devoted to health-saving technologies for preschool and school-age children and people with disabilities. The methods of health saving of students are considered by researchers less often and are reflected in the full-time format of training. The question arises: how will the health-saving technologies for the distance learning format differ?

Health care is a fundamental factor of educational work with students. It is necessary to create an educational environment at the university with the introduction of health-saving technologies. Psychological preparation of students for future professional activity in educational institutions should also be carried out considering health-saving methods. The abrupt transition of students of a pedagogical university to a distance learning format will help them as future teachers in their professional activities.

Conclusion

Thus, we will highlight some recommendations for health care in the distance learning format of mathematical disciplines:

1. Perform certain types of work in handwritten format and send it to the teacher for verification in the form of a scanned document or in the form of a high-quality photo. This will help to avoid the loss of students' writing skills and reduce the amount of time spent at the PC. But this recommendation increases the time for checking assignments from the teacher.
2. Creating test simulators using electronic educational resources with the most convenient input of the answer to the task. This recommendation will help the teacher to quickly monitor progress (display the finished results), and it will make it easier for students to enter the answer to the task, avoiding writing complex formulas.
3. The deadlines for completing tasks should be set considering all sanitary and hygienic standards for the use of ICT. You can divide the tasks into parts to avoid overloading students. If students have medical recommendations for the time spent at the computer, then it is

necessary to take this into account and extend the time for completing tasks.

4. Placement on the educational platform of recommendations on health care when working with a computer and gadgets, rules of culture of behavior in remote classes.

5. The teacher should build an educational process with a distance learning format, considering all sanitary and hygienic standards. Do not forget about hygiene pauses and remind students about them during the online class.

6. When studying mathematical disciplines, use plot problems related to health-saving technologies. As an example, we can give text tasks for optimizing labor and nutrition, for time costs, about the dangers of smoking etc. These ideas can be used in research and project activities in mathematics and when creating case tasks.

7. Conducting surveys with students in order to improve the quality of distance learning.

8. To involve students in the creative process of creating and improving educational materials for distance learning using modern educational technologies in the context of digitalization of education (creation of training videos, preparation of tests, interactive cases and participation in distance Olympiads and conferences).

All of the above will help to create a dynamically developing information educational environment of the university, which will take into account the needs of both students and teachers.

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