

ONLINE TEACHING of MATHEMATICS TO ENGINEERING STUDENTS

A. MATELYONOK, V. VAKULCHIK**Polotsk State University, Belarus**

The article reveals the problems of organizing distance learning as an educational process with all its inherent components: goals, content, methods, organizational forms, training resources. Methodological approaches to the organization of distance learning of engineering students in mathematics are considered. The analysis of forms and methods of teaching is given, the main directions of distance learning development are given. The problems solved by students and teachers in distance learning are singled out. The article determines the focus of distance learning to the development of independent cognitive skills, the formation of academic, social-personal and professional competencies, increasing students' own activity, their motivation for educational and cognitive activities. It is concluded that distance learning can be considered as an independent form of education and in combination with the traditional form as it has significant differences that cannot be implemented in the traditional form.

There is no doubt that the search for new, more efficient methods which allow in the light of the latest achievements in science and society's abilities to optimize the learning process in higher educational institutions, will always be relevant to the theory and methods of teaching mathematics. However, even the use of modern, efficient means does not always lead to the desired results. Obviously, further research in this area should be aimed not only at the development of new pan-pedagogical technologies and techniques, but also at search for the best possible modes, methods and means of training for certain specialties online.

In the present publication a set of various methods and methodological tools online, providing favorable conditions for methodically targeted assistance to students in the organization of teaching and learning activities is presented. The outlined tools will improve visibility, accessibility, depth and retention of mastering mathematical information by engineering students in class and extracurricular classes. Organizationally, they contain the potential for the construction and maintenance of continuity, completeness of the didactic cycle of mathematics educative process online. Systematic theoretical, practical, and control materials, optimized with respect to the developed scientific and methodological foundations of their creation and to systemic application, gradually provide meaningful productive activity of students.

Consider online lectures. Depending on the purpose of using the lecture, within a specific module being studied, the teacher determines what format the lecture should be presented in: lecture-information, problem lecture, lecture-visualization. However, none of these types of lectures alone, by itself, gives sufficiently high results in teaching students mathematics and developing their skills of independent work. Therefore, it seems advisable to use a combined lesson with elements of the above lectures in proportions that take into account the parameters determined by B.Ts. Badmaev in [1]. Let's highlight the main stages of designing an interactive lecture, expanding and supplementing the main stages of designing lectures in teaching mathematics in technical specialties, formulated in the study [2].

1. The educational material of the lecture should be divided into logically complete fragments.
2. For each fragment, you should choose the most effective form of presentation of the material: presentation, video lecture, work with Microsoft whiteboard or pdf document.
3. Choose a time schedule for each fragment, taking into account crises of attention: 15-20 minutes.
4. Inside the fragment, it is recommended to offer students links to other information resources that can help in in-depth study of the material: video lectures, tutorials, solved examples, video fragment.
5. After each segment, plan a time for discussion of the material studied and an opportunity for students to ask questions. [3]

Let us dwell in more detail on the preparation of an element of a practical and lecture lesson – a video fragment. Its duration is no more than 10 minutes. It contains a solution to an example or problem. The teacher performs the task using a graphics tablet, whiteboard, Microsoft PowerPoint presentation, commenting on their actions. The use of video fragments is a didactic technique that allows you to enhance the effect in teaching mathematics, since it is their students who review them several times not only when doing homework, but also in preparation for the test and exam.

Special attention is paid to the implementation of visualization in educational and cognitive process on the basis of the development and use of reserves of students' visual thinking. The approach to training, which takes into account the cognitive role of visualization, is called a cognitive visual one. In our study, a cognitive visual approach is understood as the principle of formation of educational technology on the basis of the interrelation

and unity of abstract-logical content of a teaching material and methods with visually intuitive ones. This approach involves the usage of cognitive (cognitive-semantic) features of visual information (for example, when working on illustrations). Cognitive visualization is the key to solving many educational problems. It takes into account the role of color, enhancing the perception, memorization and comprehension of educational information better than the black-and-white presentation of information. This approach encourages the widespread use of colors and shapes, graphs and drawings, of complex cognitive-visual tasks and animation in the educative process.

Conducting practical classes online in distance learning is based on the fact that the teacher demonstrates text, drawings, graphics, presentations, examples on an interactive board. During the lesson, the student also gets the opportunity to work on an interactive whiteboard, proposing solutions to problems or noting incomprehensible places in the lecture. Lessons can be recorded and published on the local network of the university, which allows them to be saved for use by students at any convenient time, on any mobile devices. This allows you not only to review the missed lesson and keep up with the passage of new material, but also to repeat the material in preparation for exams. Let's highlight the stages of conducting practical classes in online mode: the teacher publishes the topic of the lesson and uploads the necessary training materials; at the beginning of the lesson organizes an oral survey of key concepts; comments on students' homework, identifying and analyzing typical mistakes; explains a new topic using a presentation or Microsoft whiteboard and graphic tablet; answers students' questions on a new topic and on already studied material; issues individual tasks and indicates the time of their completion; as he enters, he corrects students' mistakes, gives advice on how to solve them or correct mistakes at a general meeting, with individual consultation; sums up the results of the lesson; lays out homework, a record of the practical lesson. At the same time, it is advisable to save all versions of students' homework in order to record the typical mistakes and progress of students in teaching mathematics.

Let us further present the experience of organizing distance learning in higher mathematics at the Polotsk State University. At the beginning of the year, thanks to the methodological tools of the educational and methodological complex (TMC), classroom forms of training with distance learning were integrated. In accordance with the studied module, the necessary educational and information materials were posted on the interactive sites Google Classroom and Moodle: teaching materials (manual), information tables, graphical diagrams, a fund of professionally oriented tasks, applications developed in computer algebra systems. At the same time, classes were held in the classrooms, in which theoretical and practical material was explained to students, students received experience in creating and working with special means of teaching mathematics based on teaching materials. After passing the module, in accordance with the educational and methodological map, knowledge control was carried out. If it was a test, it was posted on interactive sites, and students sent the results of their work electronically. At the same time, online and offline consultations were carried out for them. In fact, teaching mathematics was carried out using distance learning opportunities. Thus, the complete transition to distance learning that took shape then, due to objective necessity, turned out to be methodologically provided and prepared for the department and students to a certain extent. Teaching mathematics on the basis of the corporate platform Microsoft teams with the inclusion of the capabilities of Viber, interactive platforms Google Classroom and Moodle turned out to be the most effective.

Summarizing the pedagogical experience gained in the current circumstances and the results of the study, it can be argued that distance learning, in general, and lecture and practical classes online, in particular, cannot completely replace the personal communication of subjects of learning in the classroom, formed at the same time as a favorable learning environment. ... However, they can effectively solve the problems of teaching mathematics to students of technical specialties in difficult conditions, when other forms of teaching are impossible. With a reasonable, dosed, integral use of lectures and practical classes online in combination with other forms, it is possible to maintain interest and motivation of students to learn while maintaining their knowledge, skills and abilities at a sufficient level.

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