



USE OF INFORMATION TECHNOLOGIES IN MATHEMATICS LESSONS

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ABSTRACT

Requirements set for contemporary educational processes require a new approach to the teaching of natural sciences. The article provides an analysis of the main information technologies used in teaching mathematics. The role of information technology in the educational process is reviewed, the advantages of using information and computer technologies are highlighted, and the features of mathematical packages as well as their role in teaching mathematics are described. The types of lessons and their brief description when teaching the subject are given. The goals achieved through the implementation of information and communication technologies are described.

The main task today is to engage in lifelong education after higher education. At the same time, it is important to create conditions for the advancement of standards in the process of gaining tertiary education.

Famous quip of M.V. Lomonosov about the study of mathematics, which "regulates the mind" and its benefits unravels the importance of mathematics education today - to ensure the mental development of man. To ensure development, it is necessary to use new teaching technologies and introduce active teaching methods into the learning process. Herein lies the problem - the problem of personal activity in learning. Today it is one of the most pressing issues in psychological, pedagogical science, and educational practice. Teachers need to not only explain everything to their students, but also teach them to think and practice. Methods and forms of active learning can contribute to this [1].

Psychology has shown that visual information is more meaningful and better stored in memory. Only 17% of the best lectures and interesting information listened to by students are absorbed, and 50-70% of the information received by sight is remembered for a long time, and repetition can increase this number up to 100%.

Increased competition in recent years, characterized by socio-economic development, places high demands on young professionals in the labor market. As a result, the requirements for graduates have increased to some extent. It is well known that in addition to traditional teaching methods, new teaching methods are widely used by educational



institutions. It does not make sense to train highly qualified modern staff without the use of innovative technologies that meet the requirements of practice and ensure the quality of their future work.

The educational technologies used should be innovative. Innovation is an invention that has been effectively implemented. The term "innovation" is derived from the Latin word "novato", which means renewal (change), and the suffix "in" is translated as "direction". Literally, Innovatio is like a "change of direction." It is not any innovation or newly introduced innovation, but only an innovation that significantly increases the efficiency of the existing system [2].

The end of the twentieth century and the beginning of the twenty-first century saw the transition from an industrial society to an information technology society in developed countries. The difference between this society and an industrial society is that many employees receive and analyze useful information without having to do heavy physical work. This, in turn, creates new requirements for graduates of modern education to live and work in an information technology society.

Mathematical knowledge is one of the leading forms of education. This is because mathematical models that describe the interdependence of numerical descriptions of different events and processes are an integral part of research in any field of knowledge today. As computer capabilities to refine information expand, so does the role of information [3].

One of the most important issues in the education system today is access to a modern information society. To this end, information technology is being rapidly introduced into the educational process: computer-based teaching and testing programs, modeling, presentations. The introduction of ICT in the educational process increases the effectiveness and quality of teaching, increases students' interest and motivation to learn, provides access to and use of new information, saves time. Music, audio, animation, and color matching expand the possibilities of providing educational information in a variety of dynamic models.

The essence of active learning is the transition of the didactic process from a pre-regulated, programmed forms and methods to development, problem-solving, research, interest-generating, creative learning. Active learning is achieved through active teaching methods. According to SP Baranov: "Teaching method is the knowledge and practical activity of teachers and students to solve educational problems" [4].

Modern information technology is a powerful tool for development in all spheres of society. Therefore, today, traditional strategic materials and energy resources are supplemented by the information resources of society. This can be achieved only through the modernization of the education system.

The application of information technology in the educational process makes classroom and independent lessons more interesting, dynamic, and reliable, and facilitates access to a large flow of information being studied. Modern information technology provides the teacher with a large supply of technical and technological support, freeing up most of the time for live communication with students.

Relevance of ICT for the lesson process: high information capacity in the lesson; successful lesson equipment; save time; effectiveness of self-examination; increased interest in science among students; individualized learning that takes into consideration the individual



characteristics of memory and perception; thinking; increase the range of educational topics used.

The modern development of computer and telecommunication technologies significantly expands the possibilities of their use in education. All the major information technologies used in education can be divided into three categories:

- interactive (audio-visual media);
- computer training (with multimedia);
- means of telecommunication (chats, video conferencing, forums) [5].

Proper use of a variety of multimedia systems allows the teacher to constantly capture the attention of the audience, as well as highlight the most important points.

From the point of view of the use of ICT in the classroom, such classes can be divided into five groups. The affiliation of a course to a particular group is based on the technical conditions and the availability of appropriate software for the course.

1. *Demonstrative lessons.* Such tutorials are based on using a standard PowerPoint application that is part of the Microsoft Office suite. The use of such multimedia technology combines different forms of presenting information, as well as:

- provide a large amount of information for a limited period of time for the lesson;
- show geometric reflections of shapes;
- construct graphs and illustrate exchanges;
- summarizing materials;
- use of rich visual materials (ready-made graphs with interesting information, various diagrams, tables, etc.);
- creates opportunities to add historical sources to the lesson.

For example, in a geometry lesson on “The relationship of straight lines in space” it is useful to use a computer presentation material that illustrates the possible positions of two straight lines in space (for example, straight lines that can be drawn from point C, lines parallel to straight line ‘a’, and lines crossing straight line ‘a’).

Such lessons have a number of advantages:

- the topic presented in the form of a presentation is of interest to students;
- presenting information in this form reduces the time and increases the time required to practice to consolidate the theoretical knowledge;
- high level of visualization provides a high percentage of mastery and memorization

The compatibility of computer elements with other methodological approaches makes the lesson unusual, interesting, and memorable. With the right didactic approach, the computer activates students’ attention, motivates them, and develops thinking and comprehension. The above refers to the formation of an information culture for students to behave in the information society.

2. *Training or project design lessons.* It is advisable to conduct such lessons in a computer class. These classes usually use simulators to solve certain types of problems (in a geometry course, in graphing functions in algebra). In this case, the student works individually or in groups in a constructive environment to achieve a goal or to develop problem-solving skills.

3. *Integrated lessons.* Integrated classes are usually held in computer classrooms. Using standard MS-Office software, students perform a series of computational operations that



allow for a qualitative analysis of a process. In such lessons, it is possible to model a process by performing the necessary calculations. Such classes are taught in collaboration with a science teacher and a computer science teacher. The science teacher asks a question, analyzes the intermediate and final results with the students, and draws conclusions. The computer science teacher helps the students to build a mathematical model of the process and performs all the necessary calculations based on this model.

4. *Computer testing lessons.* Computer-assisted test control enables faster and more objective testing process than traditional methods. This organization of the learning process is simple and convenient in modern information processing systems. This allows the student to determine their level of knowledge, skills, and competencies during a short lesson, when other students in the group are engaged in other tasks. In the next lesson, other students will take the test. The program records the test results for later analysis and correction by the teacher.

5. *Lessons using communication technologies.* In order to conduct such classes, it is necessary to have a computer class and free access to the Internet. Communication classes allow you to freely access the global network and quickly find the information you need to test your knowledge. In such classes, a group of students is given a task to find information relevant to the lesson on a given site (depending on the topic, students can find homework in advance), or take an online test.

Rational use of ICT in the classroom is one of the ways to optimize the learning process. The student can be maximally open by organizing independent learning activities and creating conditions for an individual approach. In doing so, he demonstrates his abilities, demonstrates and develops his skills, feels needed as a person, thinks, and creates innovations.

The application of ICT in the teaching and learning process increases students' interest in reading and makes the process itself interesting and memorable [7].

The use of ICT should be the basis for the development of education. Information technology is tasked with informing the educational process and making changes to the structure of the learning process. Of course, working with a computer and using a multimedia projector makes the material more visual. Learning more about the possibilities of multimedia technology in the classroom is based on the individual work of each student with an interactive product, such as an interactive whiteboard.

Mathematics is a fairly complex science. Therefore, in order to achieve maximum effectiveness in teaching, it is necessary to find the best combination of tools, teaching methods and technologies.

In mathematics, information technology focuses on developing students' communication skills and making the teacher's work more effective. The use of computer technology to some extent allows you to achieve the following goals:

- maximum visual presentation of mathematics lessons, materials;
- increase learning motivation;
- use different forms and methods in the lesson to achieve maximum effectiveness;
- comprehensive and complex examination of knowledge and skills;
- use of test programs to quickly check the work done and evaluate it by a computer.



The use of information technology in the study of mathematics requires, first of all, a high level of training not only in knowledge, but also in the skills of working with applications. The educator must teach his students to master them. The computer can be used at all stages of the learning process: to describe a new topic; in strengthening; in repetition; in control. For students, it performs a variety of functions: a teacher, a working instrument, an object of study, and so on.

The introduction of information and communication technologies into educational process has a bright future because it provides:

- comprehensive solution of education, upbringing and development issues;
- development of skills of independent acquisition of knowledge;
- use of various interactive electronic means of education aimed at activating learning activities;
- specific requirement to each student based on their ability, motivation and level of preparation;
- partial relief for the teacher from information, exercise, and control functions, and other options.

In the teaching of mathematics, information technology can provide information that cannot be conveyed through textbooks. The computer allows for a better understanding of its individual characteristics in reading, helping it to develop independently. The use of computer technology changes the purpose and content of teaching. The use of computer technology changes the purpose and content of lessons: new methods and organizational forms of teaching emerge.

Many mathematical packages (Mathcad, Maple, MatLab, etc.) have been created in recent years. This means that a new field has emerged in mathematics. This new field of modern mathematics lies at the intersection of mathematics and informatics and relies on the use of new information technologies.

Computer-assisted math teaching with math packages aims to relieve students of hard work, focus on the material being studied, and encourage them to master the material [8].

The ability to use mathematical packages as a new technology in education shows that the following goals can be achieved:

- modernization of educational materials, as the main focus is on quality aspects;
- the number of problems for independent solution increases (due to the decrease in the number of complex substitutions);
- more complex models are studied, as inconvenient calculations are transferred to the appropriate subsystems of computer mathematics;
- develop sustainable practical skills in mathematical reasoning;
- when working with large-scale calculations, pupils and students are relieved of fear and reassured in symbolic calculations [9].

It is important to note that symbolic constituents play an important role in mathematical packages. Integrated systems of symbolic mathematics are one of the most important modern trends in the application of computers. The problem of creating and developing electronic textbooks, new teaching methods remains relevant in the teaching of mathematics.



Students should be taught using not only traditional methods. In addition to knowledge of the field of specialization, the future engineer or economist must have knowledge of information culture and the application of new information technology tools in their future profession. Computer-based mathematical systems are an ideal tool for providing search process conditions, as they lead to a dramatic increase in mathematical practice. Intensive modernization of computer algebra systems and the emergence of computer mathematical systems will expand their application in scientific and engineering research and education. Today, the use of the mathematical computer system Mathematica for the use of educational software products (<https://www.wolfram.com/solutions/education/students>) can be considered as an effective development direction.

Thus, the use of information technology in the classroom is not only a means of entrusting the teacher's interest or multifaceted creative work to the computer, but also one of the tools to intensify the learning process, accelerate cognitive activity and increase the effectiveness of science teaching. The main goal of every teacher is not only to provide a certain level of knowledge, but also to develop an interest in reading, creativity, and the formation of an active thinker. Informatization, which provides great opportunities in modern education, plays a leading role, as it is used not only to impart knowledge, but also for the self-development of the learner. Information and communication technologies have become an integral part of society and have a significant impact on the learning process, as well as the education system as a whole [11].

The use of computers and information technology in the classroom is not an innovation but a necessity. Because society is evolving so fast, both students and teachers need to keep pace with the times. Daily communication with computer technology allows you to easily find your way in the information environment.

Development of logical thinking in students during the study of mathematics; thinking skills such as analysis, systematization, and calculation of special cases should be mastered. This is achieved through the use of modern teaching methods in the learning process to intensify cognitive activity.

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