MULTIMEDIA TECHNOLOGIES AS A MEANS OF INTRODUCING GAME ELEMENTS IN THE PROCESS OF TEACHING MATHEMATICS

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Abstract
When teaching mathematics, there is the problem of integrating fundamental mathematics education and the teaching mathematics, taking into account the growing influence of information technologies.

The use of multimedia technologies in the process of teaching mathematics to students of non-mathematical faculties makes it possible to construct a learning process in such a way that it will competently combine both traditional forms of education (lectures, seminars, independent work of students) and innovative forms such as electronic presentation, electronic textbooks, search and training systems, Internet platforms and Internet portals, as well as the use of computer mathematics systems. Multimedia technologies make it possible to enhance the creative activity and cognitive interest of students, introducing elements of gamification into the learning process.

Gamification, or the use of techniques and elements of the game to increase motivation and active inclusion in the learning process, aims to create a model of feedback between the teacher and the student.

The article proposes a methodology based on multimedia technologies as a means of introducing gamification elements into the educational process. This technique allows you to use: multimedia technology as a way to create innovation; multimedia technology as an interactive model; multimedia technology with elements of gamification as a task for independent work of students; multimedia technologies as a way to obtain information from various sources (search and training systems, Internet platforms and Internet portals); multimedia technology as a way of mastering practical skills.

Gamification is an important element of the introduction of multimedia technologies in the process of teaching mathematics in higher education, it is designed to create an information-learning environment that promotes the desire of students to acquire knowledge.

Keywords: mathematics education, multimedia technologies, gamification elements.

1 INTRODUCTION
When teaching mathematics, there is the problem of integrating fundamental mathematics education and the teaching mathematics, taking into account the growing influence of information technologies.

The modern educational trend is aimed at introducing new multimedia technologies into the educational process of higher education institutions, which allow making education more qualitative and effective. Today, multimedia technologies are one of the most modern and promising areas of information technology development [3-7].

The use of multimedia technologies in the process of teaching mathematics to students of non-mathematical faculties makes it possible to construct a learning process in such a way that it will competently combine both traditional forms of education (lectures, seminars, independent work of students) and innovative forms such as electronic presentation, electronic textbooks, search and training systems, Internet platforms and Internet portals, as well as the use of computer mathematics systems. Multimedia technologies make it possible to enhance the creative activity and cognitive interest of students, introducing elements of gamification into the learning process.

Gamification, or the use of techniques and elements of the game to increase motivation and active inclusion in the learning process, aims to create a model of feedback between the teacher and the student [1].

It should be noted that the use of gamification as one of the aspects of learning leads to an increase in cognitive interest, which is a prerequisite for the success of the educational process, because without the interest in replenishing missing knowledge, without emotions, the student’s creative activity is unthinkable.
2 METHODOLOGY

The article proposes a methodology based on multimedia technologies as a means of introducing game elements into the educational process. This technique allows you to use:

- multimedia technology as a way to create innovation;
- multimedia technology as an interactive model;
- multimedia technology as a way of mastering practical skills;
- multimedia technologies as a way to obtain information from various sources (search and training systems, Internet platforms and Internet portals);
- multimedia technology with game elements as a task for independent work of students.

The use of elements of gamification allows to introduce structural diversity in the learning process, allowing to increase the effectiveness of training. However, there is also a limitation in the depth and systematization of knowledge gained by students. On the other hand, the development of multimedia technologies with game elements requires a temporary and technological resource, as well as an individual approach to the personality of each student.

3 RESULTS

Multimedia technology as a way to create innovation. The use of multimedia technologies as a way of creating innovations allows the teacher to manage the demonstration of visual material much more efficiently, opening up new possibilities in organizing the educational process. The teacher has the opportunity to combine the presentation of theoretical information with the demonstration of visual material.

When using multimedia technologies at lectures, the structure of the lecture does not fundamentally change. It still retains all the main stages, perhaps only their temporal characteristics will change. However, the advantages of using multimedia in lectures are obvious, as this allows the teacher to fill the material with a dynamic video sequence.

When interviewing students, 100% of them approve the use of multimedia presentations by teachers in lectures specifically in explaining new theoretical material. This is due to the implementation of the visibility principle and rational use of lecture time.

When presenting theoretical material, for example, in a lecture related to applications of definite integrals, presentations and dynamic video sequences are used (Fig. 1).

![Figure 1. An example of the presentation of theoretical material using multimedia technology](image-url)

Multimedia technologies as an interactive model. Especially relevant was the use of specialized software packages in the study of various disciplines in higher school [3,4,6,7], which implement the principle of visibility. In accordance with this principle, geometrical constructions are used in teaching, the visualization of which makes it easy to solve the tasks.
The ability to implement visual geometric constructions of objects is a key feature of dynamic geometry systems, such as Dynamic Geometry System (DGS) GeoGebra. This makes it possible to create a model of feedback between the teacher and the student in presenting the lecture material, introducing game elements into the presentation of the material.

Multimedia technology offers great opportunities in the process of teaching mathematics, allowing you to simulate time-consuming, full-scale experiments, which are difficult or impossible to conduct. For example, when presenting the topic of calculating the volume of bodies bounded by various surfaces, the teacher can apply a step-by-step construction of the desired body, which allows for a dynamic review of the course of solving the problem. Such a presentation assumes the teacher uses the capabilities of computer mathematics systems (Fig. 2).

![Figure 2. Elements of dynamic visualization](image)

Working with interactive models greatly helps the learning process. The use of multimedia technology allows students to become interested, improve performance and attendance, facilitate the assimilation of educational material through the introduction of game elements. Naturally, these innovations require a change in teaching methods and a creative approach from the teacher.

The use of information technology makes it possible to better master the material. Interactivity is an important part of multimedia. People remember only 20% of what they see, 30% of what they hear, 50% of what they see and hear, and as much as 80% of what they see, hear, and do at the same time.

**Multimedia technology as a way of mastering practical skills.** Activation of the creative and research components of studies involves the use of both traditional methods of organization and interactive methods (multimedia technologies) to master practical skills.

Software systems of dynamic geometry and computer math systems are useful and entertaining tools in practical classes. The complexity of the spatial representation and the absence of illustrative elements does not allow to see the objects under study as a whole and makes it difficult to study certain sections of mathematics. When solving problems of finding the volume of bodies with the help of integrals [2], the use of computer-mathematics systems allows you to optimize the learning process, rationally using time in class. For example, when calculating the volume of a body bounded by an elliptical paraboloid and a plane, the SCM allows you to visualize the object and its projection on the xOy plane (Fig. 3).
As a result, the student without difficulty sets the limits of integration and calculates the volume:

\[ V = 4 \int_{0}^{2} dx \int_{0}^{\sqrt{4-x^2}} \left( 1 - \left( \frac{x^2}{4} + \frac{y^2}{4} \right) \right) dy = 2\pi \]

Thus, the use of multimedia technology contributes to an increase in the level of mastering the material of complex sections of higher mathematics.

**Multimedia technology as a method of obtaining information from different sources (search and training systems, internet platforms and internet portals).** In many cases, multimedia from a learning tool becomes an object of study. At the same time, students use multimedia, mastering the peculiarities of using resources that combine various types of information. In this case, multimedia becomes a means of individualizing the learning process, taking into account the psychological characteristics of the learner (imagination, thinking, perception, etc.) and the rate of assimilation of educational material.

Modern students masterly own information and communication technologies and actively use electronic media. This allows you to take part of the training online, beyond the academic hours. The use of search and training systems, Internet platforms and Internet portals introduces game elements into the learning process.

For the development of cognitive skills and abilities required for the assimilation of most educational competencies, there is an online portal Lumosity (lumosity.com). It is an online platform for various games of various levels of complexity and variability, including solving mathematical and logical problems. Internet platform - POKEDU, allows you to gain knowledge in almost all industries and on any topic. Quite a lot of examples of games can be found in Mathletics - a program for engaging in math through games, Challenges, etc. The game platform Encounter is an online application that allows you to implement games in various formats: from quests in any city to solving mobile problems online.

The game form of the educational process gives an emotional impetus to the subsequent search activity, encourages to active actions and develops critical thinking.

**Multimedia technologies with game elements as a task for the independent work of students.** The use of multimedia technologies helps to significantly modify the students’ independent educational work, increasing its effectiveness.

Independent study work of students may include the development of electronic textbooks. The development of electronic textbooks is based on a powerful technology that allows you to store and transmit the bulk of the material being studied, to use text, graphics, photos, videos. This helps to more clearly and demonstratively present the material being studied. Individual or group work related to the creation of an electronic textbook provides a deep understanding and development of the material. Creative activity of students aimed at creating multimedia projects involves a preliminary search, selection and systematization of the necessary material.
Creating a multimedia product as a form of group or individual work of students is a means of introducing game elements. This contributes to the development of the individuality of each student, as well as the development of his abilities to work in a team.

4 CONCLUSIONS

Informatization of education using multimedia technologies, based on various methods, methods and technologies, significantly influences the educational process at the university. Methods of teaching mathematics based on multimedia technologies as a means of introducing elements of the game into the educational process, affect the activities of the student and teacher.

In his pedagogical activity, the teacher must successfully solve the problems of shaping the information educational environment using multimedia technology as a way to create innovations and interactive models.

A student learns to professionally use elements of the information educational environment, to operate with a large number of diverse information using modern information technologies, as well as digital educational resources. The use of multimedia technologies with game elements and computer math systems allows us to form and actively develop students' practical skills in processing and solving mathematical problems.

The developed method allows organizing independent educational process on the basis of multimedia technologies and includes the development of electronic textbooks in group or individual form with game elements. Work on the creation of group creative projects with the help of multimedia technologies contributes to the development of research and creative abilities, the choice of adequate solutions.

Multimedia technologies as a means of introducing game elements in the process of teaching mathematics in higher education are designed to create an information-learning environment that would promote the active desire of students to acquire knowledge. At the same time, such professional skills and abilities as autonomy, critical thinking, ability to make decisions, work in a team, be ready for cooperation, are formed. The use of multimedia technologies in teaching, based on various methods, methods and technologies, has a number of advantages, which undoubtedly play a large role in improving the quality of education.

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REFERENCES


