

FEATURES OF THE USE OF INFORMATION TECHNOLOGY IN TEACHING THE TOPIC "PRISM AND ITS SECTION"

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Abstract. This article presents a method for teaching prism sections using the GeoGebra program, focused on improving students' understanding of geometric concepts. The study provides detailed instructions for creating drawings of a prism and its cross-sections using various tools of the program, as well as discusses the basic principles of working with GeoGebra. The results of a survey and a study of the effectiveness of teaching methods confirm its usefulness and significance for students, demonstrating an improvement in the level of understanding of geometric concepts and skills in working with information technologies. The conclusion of the article emphasizes the importance of using modern educational technologies, such as GeoGebra, to optimize the educational process and increase its efficiency.

Keywords: Information Technology, Geometry, GeoGebra, prism cross section.

Introduction

In the modern educational context, attention to the introduction of information technologies in the learning process is becoming more and more intense. This is especially true in the context of studying geometry, where the representation of complex three-dimensional shapes, such as prisms and their cross-sections, can cause difficulties for students. The topic "Prism and its cross-sections" is an important element of the geometry course in educational institutions, as it allows students to understand the basic principles and properties of three-dimensional shapes. However, the transmission of this information by traditional teaching methods may not be effective enough, especially given the diversity of students' abilities and preferences. In this context, the study of the peculiarities of using information technologies for teaching the topic "Prism and its cross-sections" becomes extremely relevant. This will allow us not only to evaluate the effectiveness of such methods in mastering complex geometric concepts, but also to identify optimal teaching strategies that contribute to a better understanding and memorization of the material among students. Thus, this study makes an important contribution to the field of education, enriching pedagogical practice and contributing to improving the effectiveness of geometry teaching in educational institutions.

The development and research of the effectiveness of using information technologies for teaching the topic "Prism and its cross-sections" is of high importance in modern education for several reasons:

Modern educational process: At present, information technologies are becoming an integral part of the educational process. The use of modern technologies makes learning more accessible, interesting and effective for students.

Visualization and interactivity: Information technology allows you to visualize complex geometric concepts such as a prism and its cross-sections, which helps students better understand and remember the material.

Individualization of training: Using information technologies, teachers can adapt the training material to the individual needs and level of training of each student, which contributes to improving the effectiveness of training.

Preparing for the Digital Age: Information technology education helps students develop digital skills that are becoming increasingly important in today's world of work and society.

Research aspect: Conducting a study on the effectiveness of using information technologies for teaching the topic "Prism and its cross-sections" will help identify optimal approaches to integrating technologies into the educational process and develop recommendations for teachers and educational institutions.

Thus, the research is significant both from a practical and scientific point of view, since it contributes to the development of innovative approaches to teaching and preparing students for modern challenges of education and society.

Research objective

The purpose of the study "Peculiarities of using information technologies for teaching the topic 'Prism and its cross-sections'" is to study the effectiveness of using information technologies in the educational process in order to optimize teaching methods of this topic and improve students' assimilation of the material. Specific research objectives include:

Evaluation of the effectiveness of information technologies: Analysis and evaluation of the effectiveness of using various information technologies in teaching the topic "Prism and its cross-sections". This includes studying the impact of technology on students' motivation, their understanding of the material, and their academic performance.

Identification of optimal teaching methods: Identification of the most effective methods of teaching the topic "Prism and its cross-sections" using information technologies. This includes an analysis of various approaches and tools, their applicability and effectiveness.

Development of recommendations: Formulation of recommendations for teachers and educational institutions on the optimal use of information technologies in teaching the topic "Prism and its cross-sections". This includes suggestions for integrating technology into the learning process, training teachers, and selecting appropriate tools.

Contributing to the practice of education: Providing practical recommendations and instructions on the use of information technologies in teaching geometry and the topic "Prism and its cross-sections". This will improve the quality of training, increase students' motivation and prepare them for modern labor market requirements.

Thus, the aim of the study is to develop and optimize teaching methods using information technologies in order to improve the quality of education and improve students' academic performance in studying the topic "Prism and its cross-sections".

Literature review

The development of geometry and the effective use of information technologies in its teaching play a key role in modern education. In the modern world, with its rapid pace of change and development, educational methods and tools must be constantly improved to meet increasing demands and expectations. Republican researchers-methodologists A. E. Abil'kasymova, I. B. Bekboev, S. Shakilikova, M. E. Esmukan, S. T. Sabyrov, A.M. Mubarakov, A. K. Kaganbayeva, D. Rakhymbek made a significant contribution to the development of methods of teaching geometry and the use of information technologies in this process.

Hussain and Sardar (2008) suggest that information technology plays a constructive role in education, making teaching and learning more productive through collaboration in an information-rich society.

Information technologies have significantly changed the educational scenario by introducing new teaching methods, improving the accessibility and efficiency of the educational process, and influencing the very structure and organization of educational institutions. Here are some ways that information technology has changed the education scenario:

Accessibility and globalization: Information technology has made education more accessible, allowing students from different countries and regions to study remotely through online courses and educational platforms. This has led to the globalization of education and the expansion of its audience.

Individualization of learning: With the advent of information technology, education has become more individualized. E-learning platforms provide an opportunity to adapt the learning material to the individual needs of each student and take into account their learning rate.

Interactivity and visualization: Information technology allows you to create interactive learning environments using visualizations, simulations, and game elements. This makes the learning process more fun, efficient, and visual for students.

Digital resources and content: With the development of information technology, educational institutions have gained access to a large number of digital resources and content. E-books, online lessons, video lectures and other digital materials enrich the learning process and provide students with up-to-date information.

Modern methods of assessment and feedback: Information technologies allow using modern methods of assessing students' knowledge and providing feedback. Electronic tests, online surveys, and analytical tools help teachers and school administrators get fast and accurate information about the learning process.

On the role of information technologies in education, Lachhwani (2022) noted that information technologies are increasingly becoming an integral part of the education sector and provide opportunities for obtaining knowledge through Internet sites and other resources. Using ICTs, you can create virtual teacher-student interactions.

Ghavifekr and Wan Rosdy (2015) argue that the integration of ICTs with education is more effective for teachers and students. As a result of a survey of Malaysian public school teachers, researchers concluded that the level of competence of teachers with ICT tools and tools is one of the factors of success in teaching the subject.

Al-Mashari and Zairi (2000) note that information technologies offer a number of advantages related to their ability to support use in the organization. These benefits include:

Implementation of the educational strategy: IT helps educational institutions implement their educational strategies by providing access to educational resources, organizing the educational process, and adapting to changes in the educational environment.

Technological transformation: IT contributes to the transformation of teaching methods and training practices. They allow you to implement interactive teaching methods, distance learning, and optimize the management of educational resources.

Competitiveness and innovation: The use of IT can be a key competitive advantage for educational institutions. They can offer innovative educational programs, improved student services, and attractive learning environments.

Service Enhancement: IT helps educational institutions improve student service by providing them with access to online resources, remote communication with teachers, and support in solving academic issues.

Thus, IT in education plays a key role in improving the quality of education, ensuring the availability of education and maintaining the competitiveness of educational institutions.

From the existing research of national and foreign methodologists, it is clear that the introduction of information technologies has a positive impact on the learning process. However, in the context of stereometry, there is a lack of specific techniques. Our article aims to complement existing knowledge in this area by offering new approaches and techniques that use information technology to effectively teach stereometry.

Research methodology

In school course stereometry, the cross-sectional plane is defined by three points, or a point and a line, two intersecting or parallel lines, or one point and a straight line parallel to the cross-sectional plane. There may be other ways to transfer the section of polyhedra by plane.

For example: plot a cross-section of a plane passing through the points E, F, G lying on the

$ABCA_1B_1C_1$ the lines $ABCA_1B_1C_1$ of the prism (Fig. 1).

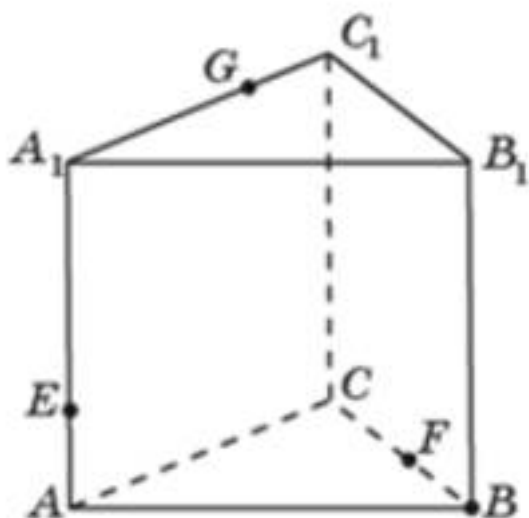


Figure 1. $ABCA_1B_1C_1$ prism

Let's draw a straight $line EG$ and denote its intersection points with $the lines C_1C$ and AC as H and I , respectively. Let's draw a straight $line IF$ and denote the point of its intersection with the face AB as K . Let's draw a straight $line FH$ and denote the point of its intersection with the face B_1C_1 as L . Connect the points E and K , G and L . The resulting pentagon $EKFLG$ will be the desired cross-section (Figure 2).

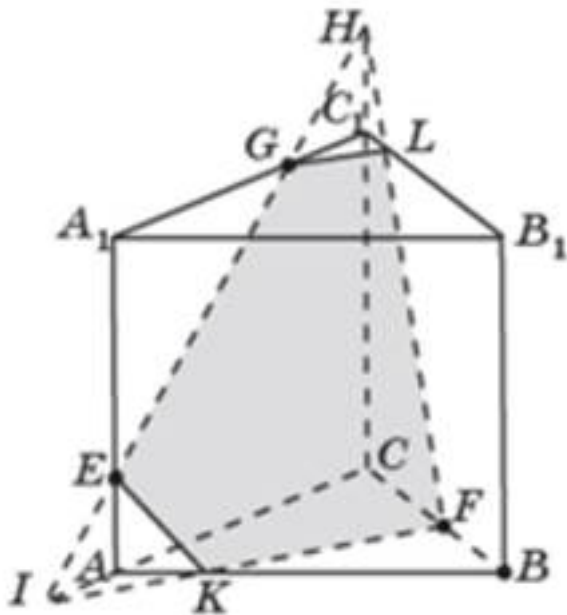


Figure 2. CFlow through **the EKFLG points**

Ways to create drawings of a prism and its cross-sections using the GeoGebra program can be as follows:

Prism

1. Launch the GeoGebra program.
2. Click "Settings". Choose a font, and select "Dots only" from "Label".
3. Click the "View" window. In the pop-up list, click "3D Canvas".
4. After that, the coordinate system will appear in the main body of the page.
5. Move the mouse over the "Pyramid" symbol in the upper horizontal panel. Click on the small white triangle.
6. A panel will appear with the "Prism" symbol on one of the lines. Click on it with the left mouse button.
7. As a result of the above actions, a key with a prism image appears on the upper horizontal panel.
8. Hover the mouse over this button and the pop-up window will prompt "specify / build the base of the prism (polygon), and then the height of the prism". That is, now you move the cursor (it will look like a cross) to the working canvas of the program page (it is grayed out) without clicking on anything.
9. Click the left mouse button to fix the first vertex of the planned base of the prism, with the second - the second, etc. Since I plan to build a prism with a triangle at its base, I left - click on three points, and then click again on the first vertex of the prism base. A triangle appears on the canvas.
10. Then move the cursor up or down to the desired height, and the program will automatically show an intermediate image of the prism.

11. If the image suits you, click the left mouse button to fix the resulting image.

Plotting a cube section with a plane

Construct a cross-section of the cube with a plane perpendicular to its diagonal. In the settings, select the font, "Designation", select "Only for dots".

1. Click "View", "Pyramid",
2. Click "Cube". We put two points on the plane. The cube is built.
3. On the toolbar, click "Direct"
4. Click the two diagonal vertices of the cube. A straight line containing the diagonal is constructed.
5. Click the Point tool. Plot a point on a straightline.
6. Click the Perpendicular Plane tool
7. Click on a point, then on a straight line to get a plane. Left-click and move it to the middle. The plane is secant. Select the cross-section.
8. Click the Intersection Curve tool. Go to the "Object Panel", click on the cube object, and on the plane (on their names). The cross-section is constructed. You can choose a different color. You can disable the plane itself and leave the cross-section.

Description of the research methodology.

A comprehensive secondary school named after K. Koshmambetov was chosen for the study. Two of the 11 classes were selected based on certain criteria, such as the overall average score in previous lessons, the age characteristics of the students and the level of training. There was a desire for the classes to be as similar as possible in terms of training.

The first selected class became an experimental group and was trained using information technology. The second selected class became a control group and was taught in the traditional way without using information technology.

Lessons on "The prism and its cross-sections" were developed for both classes.

Lessons on the topic "Prism and its sections" were developed for both classes.

Lessons for the experimental group included using the GeoGebra platform to visualize and study the material. Lessons for both groups were conducted according to the class schedule.

Data collection was carried out in several stages. Firstly, the monitoring of the learning process and the interaction of students with information technology during lessons on the topic "Prism and its sections" was carried out. This allowed us to get a direct understanding of how students interact with technology and how it affects their perception and assimilation of the material. Secondly, a survey of students was conducted in order to assess their opinion on the effectiveness of using information technology in the learning process. The questionnaire included questions about the perception of the material, the convenience of using technologies and their impact on the learning process. At the end, interviews were conducted with students and teachers to gain a deeper understanding of their experiences and opinions on the use of information technology in the educational process. During the interview, questions were asked about the advantages and disadvantages of using technologies, about the experience of interacting with them and assessing their impact on learning and understanding the material.

After data collection, the collected materials were systematized and analyzed using qualitative analysis methods. This includes organizing the responses received from the interview into a structured form to better understand the impact of information technology on learning the topic

"Prism and its cross-sections". Further, the results were interpreted in order to identify both the pros and cons of using information technologies in the educational process. This made it possible to identify the advantages and disadvantages of using technologies and highlight key aspects that should be taken into account when applying them in educational practice.

Discussion of the results

After analyzing the data, we can draw the following conclusions about the effectiveness of using information technologies in teaching the topic "Prism and its cross-sections". First, the use of information technologies demonstrates the potential to improve the assimilation of material and the involvement of students in the learning process. This is confirmed by the results of interviews, which showed that students show greater interest and understanding of the subject when using technology. However, it was also revealed that the effectiveness of using information technologies may depend on the level of training of the teacher and the availability of the necessary equipment.

Based on these findings, we can offer the following recommendations for teachers and educational institutions:

Teacher training: provide teachers with the necessary knowledge and skills in the use of information technologies in the educational process. This may include conducting special courses and trainings on the use of interactive programs and web applications.

Technical support: provide schools with modern equipment and software for the effective use of information technologies in the educational process. This includes access to interactive whiteboards, computers, and other devices needed to work with technology.

Development of educational programs: create special educational programs and materials that maximize the potential of information technology for teaching various subjects, including geometry.

Student support: Provide support to students in mastering information technologies and using them for educational purposes. This may include providing training sessions and consultations, as well as creating online resources and supporting the use of the software.

The implementation of these recommendations will help optimize the use of information technologies in the educational process and increase its effectiveness in teaching the topic "Prism and its cross-sections".

Conclusion

In the course of the study, a method for teaching prism cross-sections using the GeoGebra program was proposed and described. This technique includes step-by-step instructions for creating drawings of a prism and its cross-sections using various tools of the program.

Detailed instructions were provided on how to use the GeoGebra program to create drawings and visualize geometric objects. This included a description of the main tools and functions of the program needed to conduct geometry lessons.

As part of the study, questionnaires and data collection were conducted to assess the effectiveness of teaching methods using GeoGebra.

In general, the presented method of teaching prism sections using the GeoGebra program turned out to be effective and useful for students. It not only promotes a better understanding of geometric concepts, but also develops skills in working with modern information technologies.

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