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Improving mathematical knowledge through various innovative means

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Abstract

Innovation is not just any innovation, but only one of the applications that significantly increases the efficiency of the existing system. Accordingly, it is necessary to clearly define and differentiate the concepts of "innovative educational technologies" and "innovative education". Innovative educational technologies and programs are any educational technologies that are the result of the innovative activity of the teachers who create and develop them. Innovative education is only those innovative educational technologies and programs where the result of the innovative activity of teachers results in the creation of innovative ideas by students. The use of new technologies in mathematics lessons has a number of advantages that contribute to more effective and interesting learning. One of the most common innovative technologies in mathematics lessons is interactive whiteboards. This tool allows teachers and students to interact with the material more effectively.

***Keywords**: Innovative education, technology, mathematics education, interactive teaching*

Introduction

Innovation in education, which is broadly understood as the introduction of something new, the change and improvement of the existing, can be called an immanent characteristic of education arising from its main meaning, essence and importance. Innovation in education is understood as the process of improving pedagogical technologies, methods, techniques and teaching aids.

Currently, innovative pedagogical activity is one of the important components of the educational activity of any educational institution. Nowadays, technology penetrates all spheres of life, and education is no exception. One of the technological innovations that is actively introduced into the educational process is innovative methods of teaching mathematics. The use of new technologies in mathematics lessons has a number of advantages that contribute to more effective and interesting learning. One of the most common innovative technologies in mathematics lessons is interactive whiteboards. This tool allows teachers and students to interact with the material more effectively.

Using an interactive whiteboard allows you to clearly demonstrate examples, conduct interactive lessons, tasks and games, which makes the lessons more fun and memorable. Another innovative technology in mathematics lessons are various educational programs and applications. With their help, students can learn mathematics in a fun way, solve problems, track their progress and receive feedback. Such applications can be used for homework, which will make the learning process more interesting and motivating. For example, using the GeoGebra program in geometry lessons will optimize the learning process and increase interest in the subject. Another innovative technology in mathematics lessons is online resources. The Internet offers an endless number of resources for learning mathematics, such as video lessons, online tasks, tests, etc. This allows students to personalize their learning by choosing materials that are appropriate for their level of knowledge and learning characteristics. Online resources can be actively used in class, in extracurricular activities, and in preparing homework. Students have the opportunity to listen, view, and integrate information while using various types of Internet services and online tests.

The ability to use the Internet is necessary in the modern world. Therefore, communicating with students via e-mail, exchanging assignments and answers has become a necessity today. Thus, innovative technologies in mathematics lessons play an important role in modern education. They make the teaching process more interesting, accessible and effective, stimulating the development of collaboration, critical thinking and problem-solving skills necessary to successfully adapt to a rapidly changing world. Educators have noted that one of the best ways to learn something is to teach it to someone else. You can always apply this principle by sharing newly learned skills and knowledge with others. This process alone helps to consolidate new knowledge in your brain. Then, you need to find different ways to share what you have learned.

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For many students, learning usually involves reading textbooks, attending lectures, and doing research in the library or online. While it is important to see information and then write it down, in fact, applying new knowledge and skills is one of the best ways to improve learning. Studies show that making mistakes while learning can improve learning outcomes. According to one study, trial and error learning can actually be considered a beneficial part of the learning process, where errors are close to the true answer.

So, if you make a mistake while learning something new, take some time to correct the mistake and examine how you arrived at the wrong answer. This strategy can help you develop critical thinking skills and make you more adaptable to learning situations that require you to change your mind. Another strategy that can help is known as the practice of splitting. Instead of trying to cram all your learning into a few long sessions, you should have short, focused sessions and then take a break. While spending more time studying may seem like one of the best ways to increase learning, research shows that taking tests actually helps you remember what you have learned better, even if it is not covered on the test. Various electronic platforms allow students to review topics, take tests, and assess their knowledge. These platforms also help teachers track student achievement. Examples of mathematical software include applications such as Geogebra and Desmos.

It is often heard that in the past, that is, in the pre-computer era, the main part of mathematics was "continuous", but now the situation has changed to the opposite - most of mathematics has become discrete. Today, in addition to the classical understanding, the word "discrete" also refers to mathematics aimed at creating computer algorithms. Mathematics, with its discrete component, today creates conditions for the automation and optimization of the educational process in various disciplines, including mathematics itself.

Mathematical modeling of various objects and processes and computational experiments that replace real field experiments have long become an integral part of modern science. Now the agenda is not just calculations, but supercomputing on powerful computing systems with a productivity of hundreds of teraflops, several petaflops and more. In the near future, its performance will reach 1 petaflop.

Supercomputing is based on massively parallel computing operations and often requires the use of fundamentally different mathematical methods and algorithms compared to those that seem optimal during conventional computing. For example, over the past 40 years, mathematicians have preferred time-implicated difference schemes for solving systems of differential equations. It is now clear that explicit computational schemes are often preferred when using massively parallel operations.

Nowadays, even ordinary home and school computers use multi-core processors. Parallelism of calculations and other operations is becoming commonplace. For example, the principle of parallelism is widely used in video cards for computer games. Undoubtedly, it is time to include basic methods for parallelizing calculations in school courses in mathematics and computer science.

Another new direction in modern mathematics is fractals. This is a relatively young area of modern mathematical analysis, geometry and topology. Fractals are extremely complex and very strange-looking fields of attraction (or their boundaries). The transition from “order to chaos” occurs here. The structure of the boundaries between different fields of attraction is very important and interesting. Figuratively speaking, their centers of attraction are fighting to influence the plane. Any starting point either comes to one or another center of attraction under the influence of control, or remains on the boundary and cannot make a clear decision in which direction to start moving.

If the boundary of the field of attraction is strongly broken and is not a smooth line, then it is a fractal. Moreover, it is so broken that if we examine it under a microscope, for example, at 10x magnification, it still looks broken. By increasing the resolution of the microscope, for example, by bringing it to 100x (or more), we see that the boundary remains as curved as before.

In addition, another striking effect of self-similarity is observed: each fragment of the boundary, no matter how small, resembles the original boundary. If we examine an arbitrarily selected fragment of the boundary under a microscope, it turns out that after the corresponding rotation of the image, the same shape appears in different places, but has different sizes (infinitely decreasing).

Thus, sets of "undefined" point states, while carrying a well-organized structure of self-similarity, can be organized in an extremely complex, chaotic manner.

In modern mathematical analysis and geometry, methods for studying fractals have been developed, including computer programs. If one or another control (stimulation) of the system is known (established), then in principle it is possible to calculate and even draw (on a computer) the areas of influence of various centers of gravity and their boundaries. These methods can be useful in studying complex modern models of certain economic processes.

Another possible area of knowledge in which fractals naturally appear is the modeling of biological and social processes. Although the mathematical theory of fractals can be very useful in the field of social sciences, it has not yet been properly applied. It is no coincidence that political scientists and politicians are currently very interested in it. Using fractal boundaries, it is possible to describe the mood of that part of the population (voters) who have not yet decided on the choice of one or another center of gravity (influence).

Mathematical description and modeling of the behavior of this part of the population can be of great interest. At first glance, such indecisive, hesitant groups are structured quite chaotically. On the other hand, if a fractal structure (outwardly resembling chaos) is detected in them, this will mean that the mechanism of self-similarity is at work here.

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Currently, both higher and secondary specialized educational institutions around the world are experiencing a period of deep and comprehensive changes. They also touched on mathematics. In the past, until the 1970s, the main feature that distinguished the teaching of mathematics was the implementation of the principle of "have a little understanding, but be able to identify the deepest possible connections between them." This was achieved mainly by solving a large number of problems of increasing complexity.

Real, good mathematical education is also valuable because it is associated with the upbringing of the personality, with the development of such important qualities in a person as perseverance, intellectual honesty, will, creative enthusiasm, and aesthetic perfection. In the information society and knowledge-based economy, the role of mathematics is increasing immeasurably. As a result, the responsibility of the teacher, who is entrusted with a difficult task, is increasing.

The rapid development of technology has created new opportunities in the field of education. Electronic resources, interactive programs and online educational platforms make learning mathematics more accessible and interesting. Through these tools, complex mathematical concepts are presented visually and the level of students' understanding of the subject increases.The main goal of innovative tools is not to simplify the learning process, but to make it more efficient and student-oriented. This approach allows you to take into account the individual characteristics of each student.

Studies show that students who use innovative tools achieve higher results than those who study using traditional methods. Interactive programs and digital resources accelerate the acquisition of mathematical concepts, increase motivation and form independent learning skills.In addition, innovative approaches also have a positive impact on the development of students' creative thinking, collaboration and information processing skills

The application of various innovative tools in mathematics teaching makes a significant contribution to improving the quality of education. Digital technologies, gamification, project-based learning and artificial intelligence-based systems create conditions for deepening students' mathematical knowledge and developing practical skills. In the future, the wider application of these tools will increase the effectiveness of mathematics education and serve to prepare specialists who meet the requirements of modern society.

Literature list

1. Abbasov A.N., Əlizadə H.Ə. Pedaqogika. Bakı, Renesans, 2000, 202 s.
2. Abdullayev B.A., Zülfüqarov Ş.V. Didaktika. Bakı, ADPU-nun mətbəəsi, 2005, 230s.
3. Abdullayev, A. (2021). *Riyaziyyatın tədrisi metodikası*. Bakı: Elm nəşriyyatı.
4. Ağayev Ə.Ə. Təlim prosesi: ənənə və müasirlik. Bakı, Adiloğlu, 2006, 138 s.5. Ağayev, Ə., Talıbov, Y. (2019). *Pedaqogika*. Bakı: Təhsil Nəşriyyatı.
5. Hacıyev, R. (2020). *Təhsildə informasiya və kommunikasiya texnologiyaları*. Bakı: Müəllim nəşriyyatı.
6. Polat, E. S. (2018). *Yeni pedaqoji və informasiya texnologiyaları təhsil sistemində*. Moskva: Akademiya.
7. Əliyev, H. (2022). "Riyaziyyat dərslərində rəqəmsal texnologiyalardan istifadənin xüsusiyyətləri". *Azərbaycan məktəbi*, №2, s. 45–52.
8. Vəliyeva, S. (2021). "İnteraktiv təlim metodlarının şagird nailiyyətlərinə təsiri". *Pedaqoji Universitetin Xəbərləri*, №3, s. 67–74.
9. Boaler, J. Mathematical Mindsets. Jossey-Bass, 2016.
10. UNESCO. Digital Transformation in Education. Paris, 2023.
11. OECD. Future of Education and Skills Report. Paris, 2022.

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