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EDUCATIONAL REFORM, MATHEMATICAL CONCEPT, METHODOLOGY FOR DESCRIBING MATHEMATICAL CONCEPTS

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Abstract: Mathematics education is one of the main factors for the development of science and technology in any society. The thorough mastery of mathematical concepts by students depends on the methods and methodologies in the education system. Therefore, the reform of education and the development of a methodology for effectively describing mathematical concepts are one of the urgent issues of today. This article discusses the methodology for describing mathematical concepts and the importance of changes being introduced into the education system.

Keywords: Mathematical literacy, Abstraction, Interactive methods, GeoGebra, Desmos, Gamification, Virtual and augmented reality, Online platforms, Portfolios, Coursera, Khan Academy, Brilliant

Introduction. Today, information technologies and modern pedagogical approaches require fundamental changes in the educational process. The main reasons for educational reform are:Adaptation to the digital learning environment - Since students are accustomed to learning through the use of modern technologies, it is necessary to use interactive tools in describing mathematical concepts. Obsolescence of existing methodologies - Traditional approaches sometimes prevent students from fully understanding mathematical concepts. Development of creative and logical thinking - Mathematical concepts should serve not only as rules and formulas, but also as a means of solving problems, forming logical thinking and innovative approaches. Increasing mathematical literacy – Through educational reform, it is possible to develop the ability to apply mathematical concepts not only within the framework of science, but also in everyday life. Mathematics is a fundamental science, and its concepts are based on precise definitions. Mathematical concepts have the following characteristics:

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Certainty and consistency – Mathematical concepts, unlike other sciences, have precise definitions and laws.

Abstraction – Some concepts are abstract in nature and are difficult to describe visually.

Consistency – Each new concept is formed based on previous knowledge.

Methodological approaches of teachers play an important role in explaining mathematical concepts.

Various methodologies can be used to effectively explain mathematical concepts. The most important methods are listed below:

Providing a clear definition and examples

When explaining mathematical concepts, first of all, it is necessary to provide a clear and simple definition. For example:

A parallelogram is a quadrilateral whose opposite sides are parallel.

Later, this concept can be compared with examples and contrasting concepts to further clarify it.

Using graphics and visuals

Using diagrams, graphs, and images is very useful for explaining mathematical concepts to students. For example:

When it comes to the coordinate system, it is effective to explain by drawing clear graphs.

Step-by-step explanation

Since mathematical concepts are complex, they should be explained step by step. For example, when studying the topic of equations, it is necessary to first introduce algebraic expressions.

Giving real-life examples

Relating mathematical concepts to real life helps to understand them better. For example:

The concept of interest is more understandable to students if it is explained through examples of bank loans, discounts, and the tax system.

Using interactive methods

The following interactive methods are effective in explaining mathematical concepts:

Pair work – Students can reinforce their knowledge by explaining to each other.

Discussion – Students improve their logical thinking skills by explaining a certain concept in

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different ways.

Problem solving – Mathematical concepts are more effective when taught through practical problems.

Use of digital technologies and programs

Various mathematical programs and applications can be used in the modern education system. For example:

GeoGebra – An interactive program for explaining geometry and algebraic concepts. Desmos – A convenient tool for drawing and analyzing functions and graphs. Requirements for the description of mathematical concepts in education reform The clear description and explanation of mathematical concepts should be reformed in the following areas:

Introduction of modern pedagogical approaches – Teachers should use practical and interactive methods, not just theoretical information.

Individualized approach – Since each student has a unique learning style, customized methods should be developed.

Integrating mathematics and other subjects – Mathematical concepts can be made more understandable by linking them to computer science, physics, and economics. Improving the assessment system – Students' understanding of mathematical concepts should be assessed by solving real-world problems, rather than by traditional tests.

Effectively describing and explaining mathematical concepts plays an important role in improving the quality of education. Educational reform can improve teaching methodologies, use modern technologies, and introduce real-life approaches. Explaining mathematical concepts in clear, understandable, and interactive ways increases students' interest and develops their logical thinking skills.

In addition to traditional approaches, innovative methods are also used in teaching mathematics. These include:

Problem-Based Learning (PBL) – Students independently acquire new knowledge by solving problems.

Gamification (game-based learning) – Students' interest can be increased by introducing game elements. For example, organizing various interactive games and competitions in mathematics lessons is effective.

Differentiated approach – It is necessary to create a lesson plan taking into account the individual needs of each student.

Using technology in teaching mathematics

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The development of modern educational technologies is creating new opportunities in explaining mathematical concepts:

Teaching with the help of artificial intelligence – Special programs and applications help students acquire knowledge based on a personal approach.

Virtual and augmented reality (VR/AR) – The use of virtual models and interactive graphics in explaining geometry and complex concepts increases the effectiveness of education.

Online platforms such as Coursera, Khan Academy, Brilliant can be used as an additional tool in the teaching process. The current assessment system is based solely on testing students' knowledge through tests. However, in order to fully understand mathematical concepts, the following assessment methods should be introduced:

Portfolios - Collecting and analyzing students' work throughout the school year.

Scientific projects and research - Teaching mathematics through projects related to real-life problems.

Observational assessment - Monitoring students' activity and logical thinking skills during the lesson.

Mathematics is a subject that is needed not only in the classroom, but also in everyday life. Therefore, it is important to pay attention to the following in the teaching process:

Applied mathematics - Strengthening mathematical knowledge through real-life examples such as bank loans, taxes, investments.

Developing critical and logical thinking - Providing students with the skills to analyze and solve problems by learning mathematical concepts.

STEAM education – Introducing an integrated approach combining mathematics, science, technology, engineering and arts.

The quality of mathematics education directly depends on the qualifications of teachers. Therefore, the following reforms should be implemented:

Continuing education and professional development courses – Organizing seminars and trainings to teach teachers modern pedagogical methods.

Exchange of experience – Studying advanced foreign experiences and adapting them to the national education system.

Integrating mathematics and economics – Explaining concepts such as interest, credit, deposits, and investments based on financial literacy.

Mathematics and engineering – Demonstrate how mathematical models can be used in

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construction, design, and engineering.

Mathematics and information technology – Explaining how coding, artificial intelligence, and data analysis are based on mathematics.

Reforming mathematics education requires a long-term approach. The following strategic directions are of particular importance:

Widely introducing digital technologies into education

Creating personalized learning systems based on artificial intelligence.

Enriching the educational process with virtual laboratories and interactive teaching materials.

Developing online learning platforms and integrating them into the general educational process.

Developing students' independent learning skills

Providing students with resources for independent learning.

Developing learning based on mathematical research and creative projects.

Offer students mathematics education programs tailored to their interests and goals.

Reforming mathematics education and improving the methodology for describing mathematical concepts will serve to increase the scientific and technological literacy of the future generation. Innovative approaches will help make mathematical concepts more understandable and interesting for students.

Connecting with real life shows mathematics not only as a theoretical science, but also as a tool for solving practical problems.

Reforming the assessment system will make it possible to assess the real knowledge and skills of students.

The introduction of digital technologies will make the learning process more interactive and effective. Mathematics education is the key to the development of society, and its reform will make a significant contribution to the progress of science and technology. As a result of reforms, students can become specialists who have a deeper understanding of mathematical concepts and can effectively apply them in practice.

Various problems may arise in the process of reforming mathematics education. Identifying them and developing effective solutions will help improve the quality of education. Below are some of these problems and ways to solve them.

Low interest of students in mathematics

Many students consider mathematics to be complex and boring, as a result of which they have

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difficulty mastering knowledge related to the subject.

Using practical approaches - Explaining mathematics in relation to real life, showing how it can be used in business, economics, engineering and programming.

Gamification (gaming method) - Making lessons more interesting through games, competitions and mathematical problems.

Increasing motivation - Students' achievements and excellent results should be encouraged, for example, special certificates and awards should be provided.

The quality of mathematics teaching in the current education system depends on the qualifications of teachers. Not all teachers can fully apply modern approaches.

Involve teachers in continuing professional development courses – Organize special trainings to teach modern pedagogical technologies and interactive methods. Use online resources and video lessons – Develop free educational platforms for teachers.

Create experience exchange programs – Organize seminars so that experienced teachers can share their knowledge with other teachers. It can be difficult for teachers to convey mathematical concepts to students in an understandable way. This is especially noticeable when teaching abstract concepts. Simplify definitions and explain them step by step – Explain difficult concepts in clear and simple ways. Use visual materials – Show concepts through graphs, diagrams, and interactive animations. Explain with many examples – Explain theorems and rules not only theoretically, but also through various examples. Many students perceive mathematics as an abstract subject that is only found in textbooks and do not understand how it can be applied in everyday life. Connecting mathematics to everyday life – Explaining mathematical concepts through real-life examples such as bank interest, loans, the tax system, and investments. Practical research and project work – Giving students tasks to conduct independent research. Integration of mathematics and other subjects – Teaching mathematics in a way that connects it with physics, computer science, economics, and engineering. There is a problem of not being able to apply mathematical knowledge correctly in ordinary everyday life. This is especially noticeable in financial literacy.

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