



WAYS TO USE STEAM TECHNOLOGIES IN MATHEMATICS

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Abstract

This article explains some topics on the use of STEAM technologies in mathematics, introduction to mathematics through the STEAM approach and applications of mathematics to various fields. It discusses the advantages of mathematics over other disciplines.

Keywords: STEAM technology, robotics, programming, algorithms interactive programs, applications and gamification.

Introduction

The term STEM was the first to be introduced into the school curriculum in the United States, aimed at developing students' competence in science and technology, and this area was expanded and additional letters were added to the term. Including the addition of "R"-robotic-robotics and STREM - "A"-art-art - began to be called STEAM. The STEAM approach is an educational methodology based on the integration of science, technology, engineering, arts and mathematics.

As for the subject of the article:

We've heard the math phrase "a country without borders" more than once. Despite its ban, the phrase mathematics has very good reasons. Mathematics has a special place in human life. Experts say that the better the student at mastering mathematics, the higher the level of analytical and logical thinking. It acquires the ability not only to solve examples and problems, but also to quickly decipher, discuss and negotiate, step by step work in different situations of life. Also, the thinking inherent in mathematicians takes him to the level of predicting the course of what he wants to do in the future, the events happening around him. The science of mathematics plays a great role in the development of human intellect, focus, education of determination and will to achieve the desired goal, to ensure discipline



in an algorithmic way and to expand his thinking. Mathematics is the basis of knowledge of the universe, reveals the specific laws of events and phenomena in the environment, plays an important role in the development of production, science and technology. Therefore, mathematical culture is a component of universal culture. Abandoning the theorizing approach to teaching mathematics, achieving the formation and development of students' potential for the application of mathematical knowledge in everyday life, strengthening attention to the demonstration and activation of students' independent thinking skills – the requirement of the time is the requirement of the time. The competential approach to mathematical education involves the formation and development of practical skills that allow students to act effectively in professional, personal and everyday situations, as well as strengthening the practical, practical areas of mathematical education. The integration of our country into the world community, the development of science, technology and technology ensure that the younger generation will be competitive in the changing world labor market, master disciplines perfectly. This is ensured through the introduction of standards based on national and international best practices in the education system, including the teaching of mathematics.

The use of STEAM (Science, Technology, Engineering, Arts, Mathematics) technologies in mathematics will make the learning process more effective and interesting by introducing new methods and approaches. Below are some ways you can use STEAM technology in math lessons:

1. Programming and Algorithms

- Solve mathematical problems and develop algorithms using programming languages (e.g. Python, Scratch, Blockly).
- Explain mathematical concepts (e.g., number theory, geometry) through programming.
- For example, drawing geometric shapes or writing programs to calculate mathematical formulas.



2. Interactive Applications and Applications

- Using interactive mathematical programs such as GeoGebra, Desmos. With the help of these programs you can draw graphs, analyze functions and work with geometric shapes.
- Visually explain complex mathematical concepts through virtual labs and simulations.

3. Robotics and Engineering

- Solving mathematical problems using robotics. For example, the use of mathematical formulas and algorithms to move robots.
- Application of mathematical calculations in engineering projects (e.g., the use of geometry and trigonometry in construction projects).

4. 3D Modeling and Printing

- Creating geometric shapes using 3D printers and studying their properties.
- Creation and analysis of mathematical models (e.g., fractals) in 3D format.

5. Data Analysis and Visualization

- The use of mathematical methods in working with big data.
- Analyze data through graphs, diagrams, and charts.
- Data visualization using programs such as Excel, Tableau, etc.

6. Artificial Intelligence and Machine Learning

- Development of artificial intelligence systems using mathematical models.
- Understand machine learning algorithms and analyze them mathematically.

7. Art & Design Connections

- Creating artwork using fractal geometry.
- Applying symmetry, proportion, and other mathematical concepts in design and art.

8. Virtual and Augmented Reality (VR/AR)

- Interactive learning of mathematical concepts using virtual and augmented reality technologies.



- For example, seeing and working with 3D geometric shapes in a virtual environment.

9. Gamification

- Presenting mathematical problems in the form of a game. For example, getting ahead in the game by solving math questions.

- Use of math games and applications (e.g., Prodigy, Mathletics).

10. Projects and Research

- Implementation of STEAM projects. For example, mathematical modeling of environmental problems or the application of mathematical calculations in engineering projects.

- Encourage students to do mathematical research.

11. Online Learning Platforms

- Increase mathematical knowledge by using platforms like Khan Academy, Coursera, edX.

- Strengthen knowledge through online tests and interactive exercises.

12. Collaborative Work

- Working as a group on STEAM projects. For example, combining programming, engineering, and art to solve mathematical problems.

- Co-development of projects through online collaboration platforms (Google Docs, Miro).

The use of STEAM technology can help improve students' creativity, critical thinking, and problem-solving skills, while making math lessons more engaging and practical.

Now I will try to explain the topic of positive and negative numbers through STEAM technologies :

Oldin matematik faraz :

Positive numbers are numbers greater than 0.

Numbers less than 0 are called negative numbers. 0 is neither a positive number nor a negative number.



With the help of STEAM technologies in explaining positive and negative numbers, it is possible to teach the topic in an interactive, visual and practical way. Below, I'll explain this theme through examples through each STEAM component:

1.Science(fan)

Temperature Variation and Data Analysis;

Science Experiment:By observing temperature, students can understand positive and negative numbers:For example, the temperature in the refrigerator (below) is explained as negative numbers,the temperature in the room (0°0° above) is explained as positive numbers.

Data table: Observe temperature variations in table and graph(e.g. using excel)

2.Technology(Texnologiya)

Programming and Interactive Applications

Create projects that students learn by programming simple calculations with positive negative numbers.

Example: (Simple) A robot moves +10 steps forward or -5 steps backward starting from point "0";

3.Engineering (Muhandislik)

Construction projects and heights

On models of bridges and buildings:

Expressing altitude and depth (e.g. sea level (high)positive, negative above sea level (low).

Lego or robotics:Controlling a robot forward with positive steps and backwards with negative steps.

4.Arts(San'at)

Visual and Digital Art

Through color drawings: Express positive numbers with bright colors and negative ones with cool colors.



5. Mathematics

Matchmaking

Points system for training positive/negative numbers through games:

For example, for each correct answer it gives you +10 points, and for the wrong answer -5 points for example.

In conclusion, it is worth mentioning that STEAM technologies have a great place not only in mathematics, but also in other disciplines. Such an approach provides the advantages of increasing the student's mental capacity, being creative, at the same time, critical thinking and practical application of knowledge, as mentioned above. The main advantages of STEAM technology are the practical application of knowledge, analytical thinking, creative thinking, repetitive problem-solving, collaboration and communication, integration of multiple disciplines, and real-world application. Overall, STEAM technologies provide students with a holistic learning experience that integrates knowledge from multiple disciplines, developing critical thinking, problem-solving, creativity, collaboration, and technological literacy. These skills are critical to their academic success, personal growth, and future careers.

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