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Article

STEM Methodology in Teaching The Subject of Function

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Abstract: This article examines the effectiveness of teaching the topic of function in a 7th grade mathematics lesson by integrating STEM methodology. The article emphasizes the importance of using interactive and practical methods in teaching mathematics based on the STEM approach. Using STEM principles in teaching the topic of function helps students to understand mathematical concepts more deeply and prepares them to solve real-life problems. The article examines various ways to apply the STEM approach, including creating function graphs using scientific and technological tools, teaching the concept of function through practical projects and group work. This approach helps students develop creative thinking, analytical skills, and understand the connection of mathematics with other areas. The article also shows how the STEM approach can be effectively used in organizing non-standard lessons.

Keywords: Concept of Function, STEM Methodology, Geogebra, Cartesian Coordinate System, Treasure Hunt Method, Function, Argument of The Function, Domain of The Function, Independent Variable, Dependent Variable, Formula-Based Function Definition, Function Defined by a Formula, Function Defined by a Table, Function Defined by a Graph, "Brainstorming" Method

1. Introduction

The concept of functions in mathematics education is a complex yet highly important topic for students. Studying this topic helps students develop mathematical thinking, as well as analytical and creative approaches. However, traditional methods may not always be effective in explaining this topic to students. Therefore, the integration of new pedagogical approaches, including non-standard lessons and the STEM methodology (Science, Technology, Engineering, and Mathematics), provides students with a more engaging and effective learning experience in mathematics education.

During the study of STEM subjects, students develop the following skills:

a. Problem-solving;
b. Creativity;
c. Critical thinking;
d. Teamwork;
e. Independent thinking;
f. Initiative;
g. Communication;
h. Digital literacy.

The STEM approach is a pedagogical method that integrates science, technology, engineering, and mathematics, helping students understand the interconnection between these fields. Through this approach, students develop creative thinking and analytical

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skills, as well as the opportunity to apply practical knowledge and skills to solve various real-life problems.

This article explores how non-traditional approaches and the integration of the STEM methodology can create an effective learning environment when teaching the topic of functions in the 7th grade. The importance of this approach in increasing students' interest in mathematics, demonstrating its practical aspects, and connecting it with various other subjects is analyzed. The article also illustrates how the STEM approach can effectively enhance students' motivation and prepare them to apply their knowledge in real-life situations.

Literature Review

This article provides information on the use of student-centered technologies in mathematics lessons [3].

The article discusses how a historical approach to studying academic subjects can bring the learning process closer to scientific knowledge, with teachers discussing the history and development of mathematical concepts (mainly the contributions of great ancestors), which enhances students' interest in the subject and fosters patriotism [4].

The article analyzes the use of didactic games in the teaching process of mathematics. It is noted that the organization of lessons is also dependent on the teacher's creativity. The article highlights the importance of reinforcing the knowledge students acquire during lessons and preparing them to apply it in real-life situations [5].

The article emphasizes the significance of independent learning in strengthening students' knowledge in the modern era of science and technology. It is stressed that independent learning enhances students' confidence, teaches them to acquire knowledge on their own, and encourages them to work independently and develop their personal skills. The article also briefly outlines key aspects that should be addressed when organizing independent learning for students [6].

This article presents brief insights into word problems related to work and how they are categorized, their stages of resolution, and the basic laws encountered in such problems. It discusses the key points to focus on when solving arithmetic word problems, and provides solutions to these problems as examples. It is emphasized that these insights and solutions help students and independent learners master word problems with ease [7].

This article presents theoretical and logical foundations for developing students' creative thinking, emphasizing that solving exponential equations and inequalities correctly is impossible without them. Typical examples of exponential equations and inequalities are provided, along with guidelines for solving such problems [8].

The article offers valuable information on the importance of mastering basic knowledge and avoiding errors when solving inequalities, with a focus on the need to pay attention to key points during the resolution process. Examples of solutions to inequalities involving rational, irrational, logarithmic, and trigonometric functions using an algorithmic method are also presented [9].

These articles are dedicated to analyzing the effectiveness of interactive technologies as a means of improving the quality of the educational process. The use of interactive methods in the learning process is increasingly widespread, which demands the humanization, democratization, and liberation of education. The articles highlight how the use of information technology in lessons helps to develop a competency-based approach for students, aiding in their skill development and assisting them in becoming qualified professionals. Interactive methods are focused on achieving high results in a short time without expending significant time or physical energy, and require skillful teaching for monitoring and evaluating students' knowledge [10], [11], [12], [13], [14].

2. Materials and Methods

Effective revision of the topic taught in mathematics lessons plays a crucial role in reinforcing students' knowledge and preparing them for new topics. Specifically, before teaching the topic of functions in the 7th grade, the topic of the "Cartesian Coordinate System" is covered. To revise this topic, we will use the "Treasure Hunt" method.

The "Treasure Hunt" method is a game-based educational strategy that allows students to review the material covered and prepare for a new topic. This method, using the GeoGebra program, is aimed at revising the "Cartesian Coordinate System" topic. Students will apply the knowledge they have learned in previous lessons, find points based on given coordinates, and form a hidden word by connecting these points in the correct order. This word will serve as a key to guide students towards the new topic.

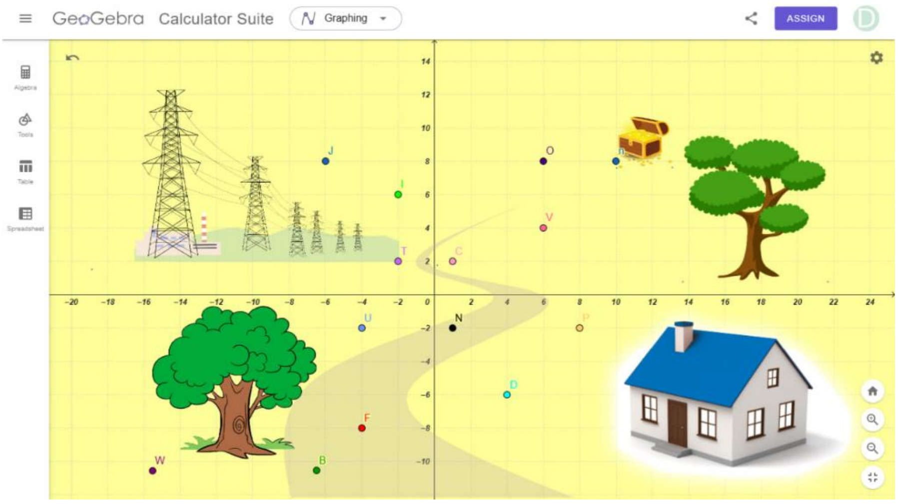

Figure 1. Visualization of the "Treasure Hunt" method in GeoGebra.

Principle of the Method:

a. Review of the Previous Topic – Students are given the task of finding points based on the concepts learned in the previous lesson. The teacher reads and explains questions to guide them.

b. Problem Solving – To reach each point, students perform tasks such as determining the coordinates, shifting the points by a certain distance, and identifying the quadrants:

   1. The starting point of the treasure is located in the third quadrant.
   2. If the abscissa of this point is -4 and the ordinate is -8, which letter corresponds to this point?
   3. To find the next point, move the starting point $+6$ units upwards along the y-axis.
   4. To find the next point, shift the point $+5$ units to the right along the x-axis.
   5. To identify the next point, find the symmetric point relative to the Ox axis.
   6. The next point leading to the treasure is located 3 units to the left along the x-axis from the current point.
   7. To find the next point, move the point 6 units upwards along the y-axis.
   8. To find the next point, shift the point 8 units to the right along the x-axis and 2 units upwards along the ordinate axis.
   9. To find the point where the treasure is located, increase the abscissa by 2 units.

c. Formation of the path – when the points are connected in order, they form a word or concept related to the new topic.

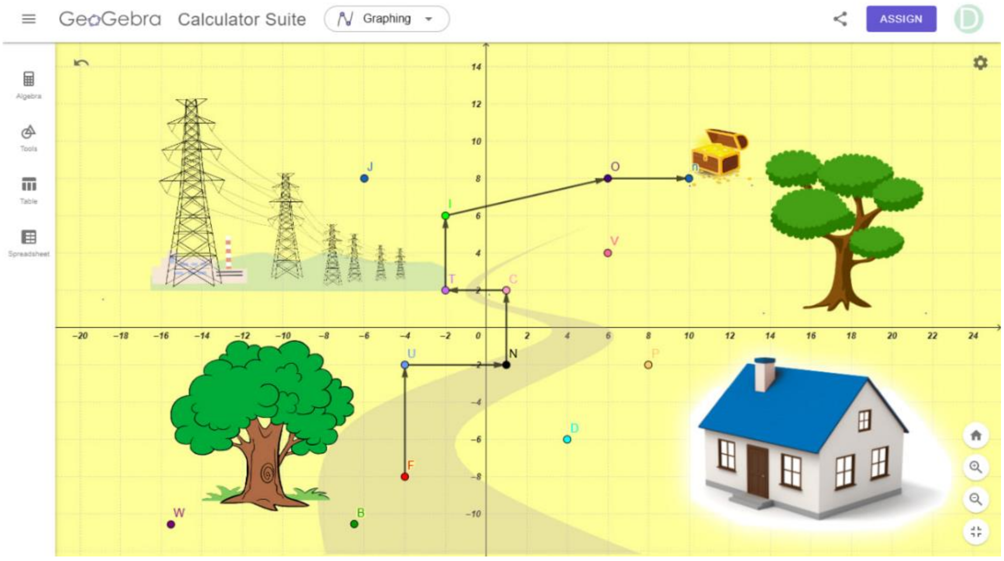

Figure 2. Formation of the word "Function."

a. Preparation for the Topic – After students have correctly identified all the points, they are introduced to the new topic and are encouraged to develop an interest in it.

Advantages of the Method:

1. Reinforcement of the Previous Topic – Students consolidate their previously learned knowledge by applying it to the task.
2. Smooth Transition to the New Topic – Since the name of the new topic is formed at the end of the game, students are prepared for the next part of the lesson.
3. Engagement and Interest – The game format ensures active participation, keeping the lesson engaging and preventing it from becoming monotonous.
4. Development of Mathematical and Logical Thinking – While finding the points, calculating the coordinates, and constructing the path, students strengthen their knowledge.

Introduction to the New Topic

Let's consider a set of values for the variable x, meaning a set of points on the number line Ox, represented by the set D.

Definition: If each value of x from this set corresponds to a unique value of another variable y, based on a specific rule, then y is said to be a function of x. The variable x is called the argument of the function, and the set D is called the domain of the function.

We have the freedom to choose the values of x from the domain D. Therefore, x is called the independent variable.

The value of y is not arbitrary but is strictly determined by the corresponding rule based on the chosen value of x. Hence, the function is also referred to as the dependent variable.

To express that the variable y is a function of the argument x, the following notations are typically used: $y = f(x)$; $y = g(x)$; $y = \varphi(x)$, and so on. The letters f, g, and φ represent the rules of the relationship between the two variables, x and y. For example, in the relation

$$y = x^2 + 1,$$

the notation $f(x) = x^2 + 1$ indicates that the value of x is squared first, and then 1 is added to the resulting value to obtain y.

Methods of Defining a Function:

1. Function Defined by a Formula:

The formula-based definition shows how to calculate the value of the function for a given argument. For example: $y = kx, y = 2x + 4, f(x) = x^2, g(t) = t^2 + 5t$. These formulas describe how the function's value is determined by the argument's value.

2. Function Defined by a Table:

In the table-based definition, the values should correspond to the function's rule. Therefore, not every table of values for x and y can represent a function. For instance, multiplication tables (e.g., for 2, 3, …) and tables listing even and odd numbers are examples of function tables.

3. Function Defined by a Graph:

The graph of a function is a set of all points in the coordinate plane where the abscissas (x-values) correspond to the values of the independent variable x, and the ordinates (y-values) represent the corresponding values of the function.

Example 1. Find the values of the function $g(x) = 5x + 2$ at $g(0), g(1)$ and $g(-1)$.

To find the function's value at given points, substitute $x = 0, x = 1$ and $x = -1$ into the given function formula:

$$g(0) = 5 \cdot 0 + 2 = 2$$
$$g(1) = 5 \cdot 1 + 2 = 7$$
$$g(-1) = 5 \cdot (-1) + 2 = -3$$

Example 2. For the function $y(x) = -2x + 1$, determine the value of x when $y(x) = -1$.

Substituting $y(x) = -1$ into the given function equation:

$$-1 = -2x + 1$$

Solving for x:

$$-2x = -1 - 1$$
$$-2x = -2$$

$x = 1$

Thus, the function takes the value -1 when $x = 1$.

Example 3. Determine whether the function exists using the given table.

x	1	2	3	4	5	6	7	8	9
y	4	8	12	16	20	24	28	32	36

From the table, we can observe that the function values change according to the rule $y(x) = 4x$.

$$y(1) = 4 \cdot 1 = 4;$$
$$y(2) = 4 \cdot 2 = 8;$$
$$y(3) = 4 \cdot 3 = 12;$$

Thus, the function has been constructed in this way.

Example 4. Verify whether the given function is well-defined based on its graph.

Solution: From the graph, we can observe that the cyclist traveled 40 km in 2.5 hours, 15 km in 1 hour, and 25 km in 1.5 hours. This confirms that the function is well-defined in this graph.

Similarly, in the passenger girl's graph, she traveled 15 km in 3.5 hours, 10 km in 2 hours, and 5 km in 1 hour, which also indicates that the function is properly defined in this case.

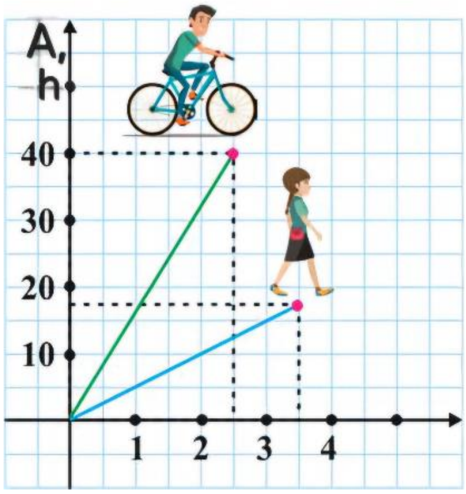

Figure 3. Solution.

To reinforce the topic, we use the "Brainstorming" method.

"Brainstorming" is a method aimed at developing students' creative thinking, where various approaches to a problem are generated, and each participant freely expresses their ideas. The goal is to develop students' independent and critical thinking skills and to teach them to solve problems quickly and effectively.

Principles of the method:

1. All ideas are accepted – students should freely express their thoughts.
2. No criticism is allowed – any suggestion is discussed but not rejected.
3. Collecting as many ideas as possible – the more ideas are expressed, the better.
4. Developing ideas – suggestions can be linked together and improved.

Stages of brainstorming:

1. Defining the problem – the teacher presents a problem or question.
2. Collecting ideas – each student shares their thoughts.
3. Analyzing and filtering – the ideas are grouped and the most suitable ones are selected.
4. Drawing conclusions – general conclusions are made, and a final solution is found.

For example, we can present the following problems as a sample:

Which of the following statements can be a function? Explain your conclusion:

1. If a car consumes 10 liters of fuel for 100 km, it can travel 500 km with 50 liters of fuel consumption.
2. The higher your income, the higher your income tax will be.
3. If the price increases, demand decreases and vice versa.
4. If the salary is 3 million sums, 300 thousand sums of income tax are paid. If the salary is 3.5 million sums, 350 thousand sums of income tax are paid.

A plastic card was inserted into the ATM to withdraw 500 thousand sums. The ATM gave 450 thousand sums.

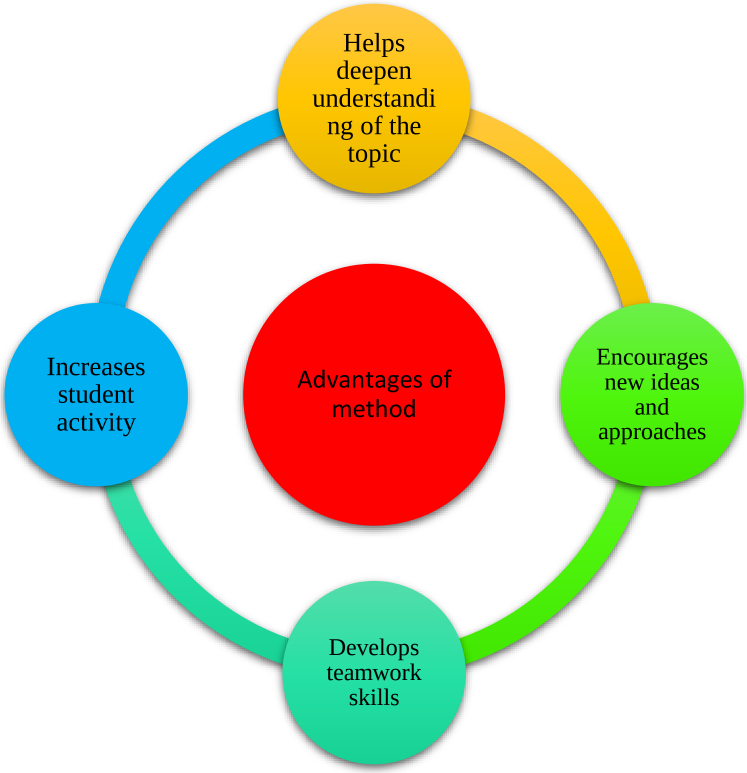

Figure 4. Advantages of method

3. Results

The experiment was conducted at School No. 2 in the Gijduvan district of Bukhara region and was organized in two 7th-grade classes (7-A and 7-B) with similar levels of academic performance. These classes were divided into experimental and control groups. The evaluation criteria for the lessons conducted in both the control and experimental classes were identical.

The effectiveness of the methodology proposed in the pedagogical research was demonstrated by comparing the indicators recorded at the end of the experimental research. According to the mathematical-statistical methods used for re-analysis, the effectiveness of the research was evaluated by determining the difference in the final indicators between the experimental and control groups after participating in the experiment. For this purpose, the first-stage final indicators of the students in the experimental and control groups were compared with their second, third, and final-stage indicators based on K. Pearson's χ^2 criterion.

In this case, the hypothesis H_0 assumes that the expected probabilities for the evaluation types in the experimental and control groups during the observation period are the same, while the alternative hypothesis H_1 assumes that the probabilities are not equal. That is:

- H_0 : There will be no significant change in the students' knowledge levels after the experimental procedure in the experimental and control groups.
- H_1 : Significant changes in the students' knowledge levels will be observed in the experimental and control groups.

To test this statistical hypothesis, the significance level α is first determined. In pedagogical research, the value of α\alpha$\alpha$ is typically set to 0.05. In this case, the confidence level is $1 - \alpha = 1 - 0.05 = 0.95$, meaning a 95% confidence level.

The critical value of χ_i^2 for $\alpha = 0.05$ is provided in Table 1.

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Table 1. The critical value of χ_i^2.

M-1	1	2	3	4	5
χ_i^2	3,84	5,99	7,81	9,49	11,07

As emphasized above, the initial levels of students' mastery were studied. The initial data of the students who participated in the experimental work are presented in the following table (see Table 2).

Table 2. Initial and final results of the students who participated in the experimental work.

Groups	Number of Students	Baholar					
		Beginning of the e.	End of the e.	Beginning of the e.	End of the e.	Beginning of the e.	End of the e.
		"3"		"4"		"5"	
Experimental	26	18	2	5	8	3	16
Control	23	15	8	6	7	2	8

The effectiveness of educational activities in the formed groups for the experiment and control subjects was determined through the results of the tests and assignments, and the final analysis of the students' knowledge levels was presented as follows (see Table 2). Based on these results, specific empirical values for each educational institution were checked and subjected to mathematical-statistical analysis. The results of the tests and written assignments conducted with the students from the control and experimental groups in the study are presented in Table 2.

In calculating the empirical values for the experimental and control groups, the indicators for the experimental group were denoted as M_i and the corresponding number of students as m_i, while the same quantities for the control group were denoted as N_i and n_i, and the formula (1) was used.

$$X_{emp}^2 = T \cdot N \cdot \sum_{i=1}^{M} \frac{(\frac{m_i}{T} - \frac{n_i}{N})}{m_i + n_i} \quad (1)$$

The arithmetic mean values and the effectiveness indicator for the experimental and control groups in the trial experiments were calculated as follows:

$$\bar{x} = \frac{1}{T} \cdot \sum_{i=1}^{M} M_i \cdot m_i, \qquad \bar{y} = \frac{1}{N} \cdot \sum_{i=1}^{M} N_i \cdot n_i, \qquad \eta = \frac{\bar{x}}{\bar{y}}$$

Since $M = 3$ in the experiment, $M - 1 = 2$, and the corresponding critical value $\chi_{0,05}^2 = 5,99$ was obtained.

The values for the educational institution were calculated using this formula. The students' initial results at the beginning of the experiment:

$$X_{emp}^{2} = 26 \cdot 23 \cdot \left[\frac{(\frac{18}{26} - \frac{15}{23})^2}{18+15} + \frac{(\frac{5}{26} - \frac{6}{23})^2}{5+6} + \frac{(\frac{3}{26} - \frac{2}{23})^2}{3+2} \right] \approx 0,03;$$

$$\bar{x} = \frac{1}{26} \cdot [3 \cdot 18 + 4 \cdot 5 + 5 \cdot 3] \approx 3,42;$$

$$\bar{y} = \frac{1}{23} \cdot [3 \cdot 15 + 4 \cdot 6 + 5 \cdot 2] \approx 3,42;$$

$$\eta = \frac{3,42}{3,42} \approx 1,00.$$

The obtained empirical value is smaller than the critical value, i.e., 0.03 < 5.99. This indicates that at the beginning of the experiment, the H_0 hypothesis can be accepted. In other words, before conducting the experimental study, there was no significant difference in students' knowledge levels between the experimental and control groups.

Students' final results at the end of the experiment:

$$X_{emp}^{2} = 26 \cdot 23 \cdot \left[\frac{(\frac{2}{26} - \frac{8}{23})^2}{2+8} + \frac{(\frac{8}{26} - \frac{7}{23})^2}{8+7} + \frac{(\frac{16}{26} - \frac{8}{23})^2}{16+8} \right] \approx 6,17;$$

$$\bar{x} = \frac{1}{26} \cdot [3 \cdot 2 + 4 \cdot 8 + 5 \cdot 16] \approx 4,54;$$

$$\bar{y} = \frac{1}{23} \cdot [3 \cdot 8 + 4 \cdot 7 + 5 \cdot 8] \approx 4,00;$$

$$\eta = \frac{4,54}{4,00} \approx 1,13.$$

The obtained empirical value is greater than the critical value, i.e., 6,17 > 5,99. This confirms that the proposed methodology is effective, which supports the rejection of the null hypothesis H_0. In other words, after conducting the experimental study, a significant improvement in students' knowledge levels was observed in both the experimental and control groups.

From the above results, it was determined that the performance indicators in the experimental group were 13% $(1,13 - 1,00 = 0,13)$ higher than those in the control group.

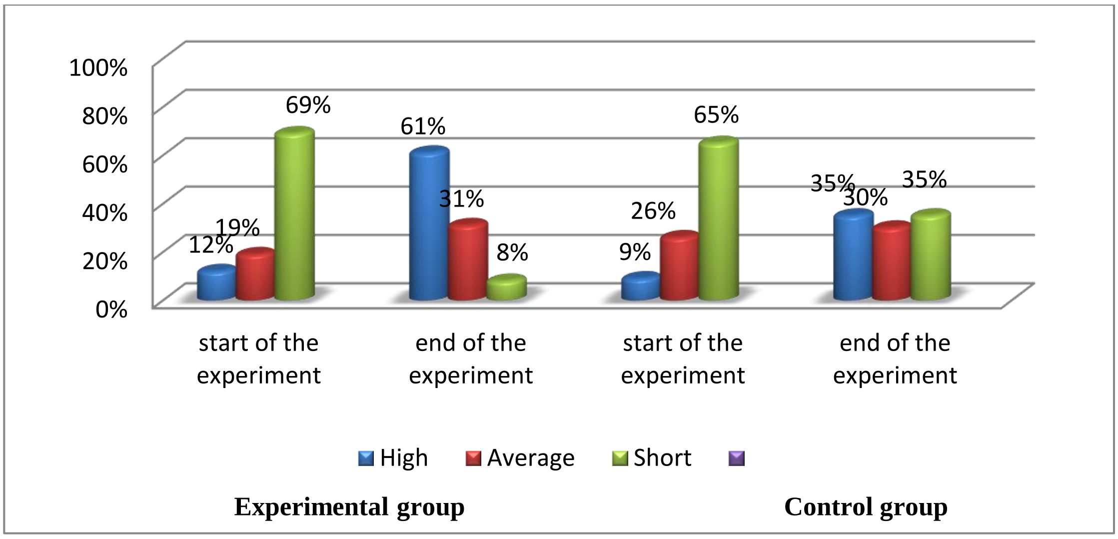

Figure 4. A diagram illustrating the academic performance indicators of students who participated in the experimental study at Gijduvon District School No. 2.

4. Discussion

We begin the statistical analysis by calculating the average academic performance indicators for both groups.

$$\bar{x} = \frac{1}{T} * \sum_{i=1}^{4} M_i * m_i = \frac{1}{26} \cdot [3 \cdot 2 + 4 \cdot 8 + 5 \cdot 16] \approx 4,54;$$

$$\bar{y} = \frac{1}{N} * \sum_{j=1}^{4} N_j * \mathrm{n}_j = \frac{1}{23} \cdot [3 \cdot 8 + 4 \cdot 7 + 5 \cdot 8] \approx 4,00;$$

Thus, the average academic performance in the experimental group is higher than in the control group: $\bar{x} = 4,54 > 4,00 = \bar{y}$. The next task is to conduct test procedures, identifying possible errors in the assessment of students' knowledge. To do this, we first calculate the statistical sample variances.

$$S_x^2 = \frac{1}{T} \sum_{i=1}^{4} M_i * m_i^2 - \bar{x}^2 = \frac{1}{26}\left[3^2 * 2 + 4^2 * 8 + 5^2 * 16\right] - 4,54^2 \approx 0,39$$

$$S_y^2 = \frac{1}{N} \sum_{i=1}^{4} N_i * \mathrm{n}_i^2 - \bar{y}^2 = \frac{1}{23}\left[3^2 * 8 + 4^2 * 7 + 5^2 * 8\right] - 4,00^2 \approx 0,70$$

We will now calculate the coefficient of variation for each group:

$$V_x = \frac{S_x}{\bar{x}} * 100\% = \frac{0,62}{4,54} * 100\% = 13,65\%$$

$$V_y = \frac{S_y}{\bar{y}} * 100\% = \frac{0,84}{4,00} * 100\% = 21,00\%$$

Since the coefficient of variation for both groups is less than 30%, it confirms that the experimentally determined mean achievement rates (x and y) accurately reflect the corresponding theoretical mean values, meaning $\bar{x} = a_x$ and $\bar{y} = a_y$.

For these theoretical mean values, we will calculate the 95% confidence intervals using the standard method: $t_\alpha = 1,96$. The interval will be as follows:

$$\bar{x} - \frac{1,96 * S_x}{\sqrt{T}} \le a_x \le \bar{x} + \frac{1,96 * S_x}{\sqrt{T}}; \quad \bar{y} - \frac{1,96 * S_y}{\sqrt{N}} \le a_y \le \bar{y} + \frac{1,96 * S_y}{\sqrt{N}};$$

That is $4,30 \le a_x \le 4,78; \ 3,66 \le a_y \le 4,34$.

It can be seen that the theoretical average achievement indicators corresponding to the experimental and control groups are located in non-overlapping intervals. Therefore, it is always true that $a_x > a_y$, meaning that the average achievement of students will always be higher when teaching the concept of functions using various STEM approaches. These approaches include creating function graphs with scientific and technological tools, practical projects, and group work. Specifically, using GeoGebra's 'Treasure Hunt' method and the "Brainstorming" method for teaching function concepts through these approaches will always result in higher achievement scores for the groups.

The efficiency coefficients were determined based on the ratio of the arithmetic mean values of the assessments for the experimental and control groups.

The results of the pedagogical experiments conducted in the experimental and control groups were statistically reprocessed based on the formulas mentioned above. The statistical data were determined as follows.

Table 3. The overall result of the analysis of the experimental trials conducted in the selected educational institutions.

	Experimental Group T=26			**Control Group N=23**		
Evaluation Value	Low	Average	High	Low	Average	High
Number of Corresponding Grades	2	8	16	8	7	8
Mean of Evaluations	$\bar{x} = 4,54$			$\bar{y} = 4,00$		
Efficiency Coefficient	$\eta = \frac{\bar{x}}{\bar{y}} = \frac{4,54}{4,00} \approx 1,13.$					
Confidence Interval	$4,30 \le a_x \le 4,78;$			$3,66 \le a_y \le 4,34$.		

5. Conclusion

The textbook for the 7th grade was selected as the primary source for composing this article. In contemporary educational settings, particularly in developing nations, methods that contribute to the enhancement of the teaching and learning process are increasingly being identified under the umbrella of modern pedagogical technologies. These methods serve as the foundation for substantial practical experience in supporting and advancing education. By employing contemporary teaching strategies, students are better able to grasp the material, and in turn, can explain the concepts to their peers with a similar level of understanding [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14].

REFERENCES

[1] A. Akmalov et al., *7th Grade Algebra: Methodological Guide for Teachers of General Secondary Education Schools*, Tashkent, Uzbekistan: "O'qituvchi" Publishing House, 2022.

[2] *Adding and Subtracting Mixed Numbers and Improper Fractions*, Tutoring and Learning Centre, George Brown College, 2014. Available: www.georgebrown.ca/tlc

[3] A. Sh. Rashidov, "Person-centered learning technology in mathematics lessons," *Center for Scientific Publications*, no. 3, pp. 68-72, 2021.

[4] A. Sh. Rashidov, "Conducting practical exercises on mathematical sciences for students of social and humanitarian education," *Science and Education*, no. 9, pp. 283-291.

[5] O. O. Khalloqova and A. Rashidov, "Threshold eigenvalue of the Friedrichs model," *Young Scientist*, no. 15, pp. 1-3, 2015.

[6] A. Sh. Rashidov, "Interactive methods in studying the topic 'Definite Integral and its Applications'," *Scientific Research*, vol. 34, no. 3, pp. 21-24.

[7] A. Sh. Rashidov, "The role of creative thinking and creativity in the intellectual development of youth," *Pedagogical Mastery*, no. 7, pp. 114-116, 2021.

[8] A. Sh. Rashidov, "Developing students' creative thinking in mathematical sciences," *Science and Society*, no. 3, pp. 45-46.

[9] A. Sh. Rashidov, "Advanced practices in modern education and innovative technologies," *Center for Scientific Publications*, no. 3, pp. 68-72, 2021.

[10] A. Sh. Rashidov and M. F. Faxridinova, "International assessment programs in student knowledge evaluation," *Proceedings of the Republican Scientific-Theoretical Conference on the Role of Physics, Mathematics, and Information Technologies in Innovative Development*, Bukhara, pp. 222-227.

[11] A. Sh. Rashidov and S. A. Mehmonova, "Interactive methods in teaching mathematical analysis: The 'Case Study' method," *Proceedings of the Republican Scientific-Theoretical Conference on the Role of Physics, Mathematics, and Information Technologies in Innovative Development*, Bukhara, pp. 165-169.

[12] X. R. Rasulov and A. Sh. Rashidov, "Organization of practical classes based on innovative technologies in mathematics lessons," *Science, Technology, and Education*, no. 8 (72), pp. 29-32, 2020.

[13] A. Sh. Rashidov, "Identifying prospects for improving distance learning models through expert evaluation methods," *Pedagogical Mastery*, no. 2, pp. 163-171, Bukhara, 2020.

[14] A. Sh. Rashidov, "Advanced practices in modern education and innovative technologies," *Sources of Science*, no. 10, pp. 83-86, Urgench, 2020.