



THE IMPORTANCE OF TEACHING COMBINATORIAL CONTENT PROBLEMS IN PRIMARY GRADES USING INNOVATIVE METHODS

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Abstract:

The article analyzes the importance of innovative methods in teaching combinatorial problems to primary school students. The theory of combinatorics, its history of development and practical significance are presented. Effective methods for explaining combinatorial problems based on modern interactive methods, digital technologies and the STEAM approach are also presented. The importance of using games and visual methods to increase students' interest, develop logical thinking skills and increase the effectiveness of the lesson is highlighted. The article presents interactive platforms, group exercises and game methods that ensure the active participation of students, and shows their positive impact on the educational process.

Keywords: Primary school, combinatorics, interactive methods, digital technologies, STEAM, game-based education, logical thinking, mathematics, didactic games, educational innovations.

Introduction

Innovative approaches have become one of the important issues that the education system must find a solution to and constantly keep up with the times. In particular, there is a great opportunity to achieve positive results in stimulating interest in mathematical problems among primary school students and developing the learning process using the STEAM method and digital games. Problems related to finding various combinations of elements and their number are called combinatorics problems. Such problems are studied in the branch of mathematics - combinatorics. Combinatorics emerged as an independent science mainly in the



17th-19th centuries, and scientists such as B. Pascal, P. Fermat, G. Leibniz, Y. Bernoulli, L. Euler made a great contribution to its development. Since combinatorics mainly studies finite sets, their subsets, tuples composed of elements of a finite set, and the problems of finding their number, it can be considered as a part of set theory. Probability theory and combinatorics were most actively developed in the 20th century. And Russian and Soviet mathematicians made a great contribution to this issue. Among them, for example, Kolmogorov, Chebyshev, Lyapunov, Markov. They significantly expanded the areas of application, studied and described the law of large numbers, the central limit theorem, and the axiomatics of probability theory. All this became the basis for an entire science. Today, it is difficult to overestimate the importance of elements of combinatorics and probability theory in physics, chemistry, biology, and many other fields, especially in their practical sphere.

Using modern interactive methods in solving combinatorial problems prevents boredom during the lesson and ensures that the lesson is effective and interesting. The interactive method serves to activate the assimilation of knowledge by students and teachers in the educational process, and to develop their personal qualities. Nowadays, many practical problems are solved directly or indirectly by referring to combinatorics problems. This science helps to understand algebra, geometry, and probability theory more deeply. Solving combinatorial problems contributes to the mental and logical development of the child.

The use of modern information and communication technologies in the lesson process helps students to think independently, expand their creative search and logical thinking, as well as connect what they have learned in the lessons with life and increase their interest in the lesson. It allows them to be aware of modern educational programs. Effective use of such conditions created on the basis of modern requirements by teachers and the organization of lessons on the basis of advanced pedagogical and information and communication technologies guarantees the quality of the educational process. As a result of the use of multimedia technologies and their applications in each lesson independent, creative thinking in students is further developed. It is worth noting that the use of interactive and modern methods, information and communication tools in primary school lessons leads to modern and creative thinking in students and serves to increase the quality and efficiency of the lesson. Interactive games in mathematics



lessons are distinguished by their creativity. They have the richest possible active character "creative field". Interactive games are an activity, process and teaching method. Games are aimed at various goals. They are used for didactic, educational, educational and socialization purposes. Several examples of games can be given: "ladder", role-playing games, "6x6 method", "brainstorming", etc. Didactic games in education serve the purpose of teaching and are conducted in an interesting, entertaining, understandable way. Children train wholeheartedly in order to win, master the material well.

The following interactive methods are effective in explaining combinatorial problems to elementary school students:

Digital games and interactive platforms: Explaining combinatorial problems through interactive tools such as Kahoot, Quizizz, GeoGebra, Desmos.

For example, the game "How many ways?": Students are given 3 different colored pencils and 2 different colored pens. They determine how they can be combined in different ways.

"Position Game": Children take turns standing in different positions and forming combinations.

"Friendship Group": Students wearing different colored T-shirts get together and count how many different combinations they can make.

Card games: Children are given cards with different symbols on them and they create different combinations and calculate the results.

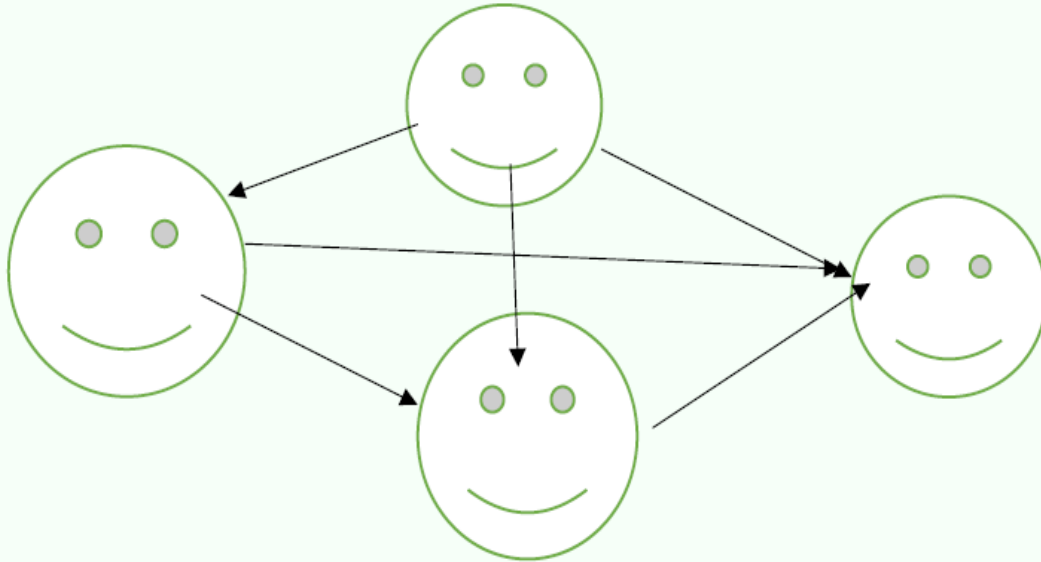
Ready-made combinatorial cubes: Throwing cubes with different numbers or shapes on each side and analyzing the resulting combinations.

Textbook combinatorics problems are presented in the following forms:

If 4 students in a class shake hands and greet each other, how many times will they greet each other?

The problem can be solved more easily by asking students to show the problem on the board instead of explaining it in words and formulas. One student comes to the board and the problem asks people to greet each other. The students shake hands and one student counts the number of greetings. This method prevents students from getting bored and is easier than counting using a formula. Now, the problem can be solved with the following formula. The first student greets the other three students, and the second student greets the first student who is greeting.

Answer: $3 + 2 + 1 = 6$ There are an equal number of greetings.



In conclusion, the use of interactive methods in teaching combinatorics to elementary school students makes the learning process more effective, understandable and interesting. Students learn to solve problems in different ways, which increases their logical thinking skills. Through interactive games, software and visual materials, students gain a clearer understanding of combinatorics concepts. Through games related to physical activity, group tasks and role-playing, students actively participate in the lesson. Through examples related to everyday situations (for example, choosing clothes, making directions, creating a menu), students understand the importance of combinatorics.

Explaining combinatorial problems in an interactive way not only increases students' logical thinking and problem-solving skills, but also actively engages them in the learning process. The integration of digital technologies, games, physical activity activities, and STEAM methods further increases students' interest in mathematics.

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