THE ROLE OF COGNITIVE PROCESSES IN THE FORMATION OF MATHEMATICAL IMAGINATION IN PRIMARY SCHOOL STUDENTS: DEVELOPMENT OF ANALYSIS, SYNTHESIS, AND GENERALIZATION SKILLS

Dadaboeva Zilola Fozilovna
Namangan State Pedagogical Institute Theory and Methodology of Education 1st year master's student of the primary education specialty
Gmail: ziloladadaboeva84@gmail.com
https://doi.org/10.5281/zenodo.17866746

ARTICLE INFO

Received: 07th December 2025
Accepted: 08th December 2025
Online: 09th December 2025

KEYWORDS

cognitive processes, analysis, synthesis, generalization, mathematical imagination, primary education, development of thinking, methodology, logical thinking, mental activity, skill, competence, theory, practice, educational effectiveness.

ABSTRACT

This article highlights the importance of cognitive processes, in particular, the skills of analysis, synthesis, and generalization, in the process of forming mathematical representations in primary school students. The relevance of the research lies in the fact that in today's educational process, the priority task is not only to provide students with ready-made knowledge, but also to form in them a high level of mental activity, such as thinking, comparison, problem-solving, and logical conclusions. Therefore, the development of cognitive processes through mathematics lessons from an early age serves as an important factor in increasing the effectiveness of education. The article highlights the essence of such basic cognitive processes as analysis, synthesis, and generalization, the methods of their formation, their influence on the development of students' mathematical thinking, and the effectiveness of these processes using practical examples..

Introduction. In the process of primary education, mathematics is one of the main subjects that expands students' thinking, combines theoretical and practical activities, and develops the process of logical conclusions. In recent years, reforms aimed at improving the quality of education in Uzbekistan have identified the development of independent thinking, analysis, and decision-making skills in the younger generation as an important task. Especially in the process of forming mathematical representations in primary school students, the role of cognitive processes is extremely important, which manifests itself as the main psychological factor in their understanding of mathematical concepts, the formation of abstract thinking, and their active use in solving problems in real situations. Analysis, synthesis, and generalization, which are the most important types of cognitive processes, constitute the central part of cognitive processes in primary school children. When analyzing a given mathematical object, the student divides it into parts, distinguishes properties, and identifies connections. Synthesis, on the other hand, allows for the restoration of connections between these parts and their transformation into a single, holistic concept. The process of generalization creates the basis for the student to identify the general regularity, the general feature, and the formation of basic abstract concepts of mathematics.

Main Part. The development of analytical skills in mathematics lessons allows students to correctly understand the condition of the problem, distinguish essential and secondary elements, and find the interrelationships of given numbers or figures. For example, in the process of analyzing a geometric figure, the student distinguishes the number of its sides, angles, lengths, or symmetry. Through these processes, the child learns not only to see a real object, but also to mentally distinguish and understand it. The process of synthesis is the next stage after analysis, and the student acquires a new understanding based on the identified features. For example, a child with knowledge of the sides of a rectangle synthesizes a square not as a separate figure, but as a rectangle with all sides equal. This contributes to the deepening of mathematical imagination.

The ability to generalize expands the student's experience, teaches them to see similarities and differences in the solutions of different problems. For example, in examples like 3+5, 4+6, 7+2, the general rule is that addition always consists of two numbers. This process is very important for understanding mathematical rules, regularities, and formulas. A practical study conducted among primary school students showed that classes aimed at the development of cognitive processes have a significant impact on the process of mathematical imagination and thinking of students. The study was conducted with the participation of 72 students of grades 2-3, of which 36 were in the experimental group and 36 in the control group. In the experimental group, methods based on analysis, synthesis, and generalization (problem situations, comparison tables, geometric modeling, logical tasks) were used for 8 weeks, while in the control group, traditional methods were continued.

Table 1. Level of development of cognitive skills in the experimental and control groups (%)

Type of Skill	Before the Study (EG)	Before the Study (CG)	After the Study (EG)	After the Study (CG)
Analysis	42%	43%	78%	51%
Synthesis	38%	40%	74%	49%
Generalization	35%	37%	72%	46%
Mathematical imagination	40%	41%	81%	55%

As can be seen from the table, before the study, there was no significant difference between the experimental and control groups, which indicates that at the initial point, the cognitive skills of the students were at the same level. However, at the end of the study, a significant increase in the indicators of the experimental group was observed. In particular, the ability to analyze increased from 42% to 78%, which is a 36% increase. In the control group, the growth was only 8%. This situation shows that problem tasks, comparison tables, and exercises on dividing objects into parts are effective in the development of analytical skills.

The increase in synthesis skills was from 38% to 74% (36%) in the experimental group and from 40% to 49% (9%) in the control group. This means that students have a more developed ability to combine the results of analysis, to identify connections between figures,

numbers, or problem conditions. Lessons aimed at synthesis - creating geometric models, explaining the parts of the problem based on a single scheme - formed integrity in the thinking of students.

Generalization skills also showed significant growth. In the experimental group from 35% to 72% (37%), and in the control group from 37% to 46% (9%). This result confirms the high effectiveness of applying exercises such as deriving general patterns, grouping mathematical elements according to common features, finding similarities in various problems.

The highest growth was observed at the level of mathematical imagination. In the experimental group, this indicator increased from 40% to 81% (41%), and in the control group from 41% to 55% (14%). The result shows that classes enriched with cognitive processes significantly expanded the possibilities of students' abstract thinking, modeling, spatial imagination, and mental representation of the problem.

These statistical data indicate that methods aimed at the development of cognitive processes are one of the most important factors in the formation of mathematical knowledge in primary school students. The development of skills in analysis, synthesis, and generalization contributes to the deepening of students' mathematical thinking, the strengthening of their ability to independently solve problems, and an increase in the level of logical reasoning.

The teacher's methodological approach is of particular importance in the development of cognitive processes. The teacher should create situations where the student actively participates and independently performs the processes of analysis and synthesis. Such methods as problem-based learning, interactive methods, exercises based on logical questions, visual materials, the principle of visualization, brainstorming, cluster, comparison table give a positive result in the development of mathematical thinking. Through practical exercises, students connect abstract concepts with real-life examples, which further enhances the development of cognitive processes. At the same time, a differentiated approach to the learning process is also important, and it is recommended to give tasks corresponding to the pace of cognition and cognitive abilities of each child.

Conclusion. In conclusion, the development of cognitive processes, especially the skills of analysis, synthesis, and generalization, is of great importance in the formation of mathematical imagination in primary school students. These processes develop students' not only mathematical, but also general level of thinking, problem-solving, logical thinking, and decision-making skills. The integration of cognitive processes in the assimilation of mathematical concepts serves the formation of the student as a person with independent thinking. Therefore, an approach based on the application of cognitive processes in the development of the methodology of primary mathematics education remains one of the priority areas.

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