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ON ESTABLISHING A BALANCE BETWEEN THE CONTINUOUS AND DISCRETE COMPONENTS OF THE SCHOOL MATHEMATICS CURRICULUM

Modern school mathematics education requires a reconsideration of its content. Traditionally, it has focused on the study of numbers, algebraic transformations, functions, geometric figures, and elements of mathematical analysis. At the same time, the development of information technologies, artificial intelligence, network theory, cryptography, and data science increasingly relies on discrete structures such as algorithms, graphs, logical schemes, codes, and finite sets. Therefore, the issue is not to replace continuous mathematics with discrete mathematics, but to establish a meaningful balance between them.

The State Standard of Basic Secondary Education defines learning outcomes that include the development of logical thinking, the ability to model situations, analyze data, and solve problems. The Conceptual Foundations of the Mathematics Educational Field also emphasize the importance of developing mathematical competence, inquiry skills, and the ability to use mathematical models. However, in the current curricula, elements of discrete mathematics are represented only fragmentarily, mainly through isolated topics in combinatorics, statistics, and probability theory.

The purpose of this article is to substantiate the necessity of establishing a balance between the continuous and discrete components of the school mathematics curriculum and to identify possible ways of integrating elements of discrete mathematics into the educational process.

International experience demonstrates a growing interest in the discrete component of mathematics education. In many countries, elements of graph theory, algorithms, combinatorics, coding, and data analysis are integrated into school mathematics and computer science curricula. International studies indicate that modern educational systems are gradually expanding the content of mathematics education through statistics, data science, algorithmic thinking, and mathematical modelling (OECD, 2024).

In France and England, discrete content is most often incorporated through combinatorial, logical, and programming tasks. German educational standards emphasize mathematical modelling and work with structures. In Japan, considerable attention is paid to the development of logical thinking and systematic problem solving. South Korea includes courses related to artificial intelligence, applied statistics, and mathematical projects in upper secondary education. In China, alongside traditional mathematical topics, students study combinatorial methods, algorithmic approaches, and elements of discrete structures.

A comparative analysis shows that the problem of balancing continuous and discrete mathematics is common to most contemporary educational systems. At the same time, a separate school course in discrete mathematics is rarely introduced. A much more widespread approach is the integration of relevant content into existing mathematics subjects.

In our opinion, achieving such a balance should be based on three principles. First, students should perceive continuous and discrete mathematics as complementary ways of describing reality. Second, discrete content should be represented not by isolated tasks but by a coherent system of interconnected concepts. Third, the relationship between mathematics and computer science should be meaningful rather than merely formal.

In this regard, it is advisable to consider the discrete component of the school curriculum through three cross-cutting content strands.

The first strand is graph theory. Graphs provide a natural means of describing transportation networks, social connections, computer networks, routes, and many other objects of the modern world. In lower grades, they can be used to model simple routes and relationships between objects. In middle school, students may study trees, networks, shortest paths, and optimization problems. In upper secondary school, graph theory can be connected with geometry, polyhedra, and elements of topological thinking.

The second strand is combinatorics and algorithms. Combinatorial thinking develops the ability to analyze possible courses of action, construct systematic enumerations, and estimate the number of possible outcomes. The study of combinatorics should begin with elementary tasks involving the arrangement and classification of objects, gradually progressing to the rules of sum and product, permutations, variations, and combinations. Particular attention should be paid to algorithmic methods of problem solving, which naturally connect mathematics and computer science.

The third strand is discrete processes and coding. These concepts create a natural link between mathematics, computer science, and modern digital technologies. This strand may include numeral systems, information representation, codes, encryption, logical operations, finite automata, and other models of discrete processes. Studying such concepts contributes to the development of digital literacy and a deeper understanding of the principles underlying information systems.

The proposed content strands do not require a radical restructuring of the school mathematics curriculum. They can be integrated into existing topics through specially selected tasks, research projects, and interdisciplinary connections. Such an approach makes it possible to gradually broaden students' mathematical outlook without disrupting the logic of traditional instruction.

Conclusions. The conducted analysis has shown that the modern school mathematics curriculum remains predominantly focused on the continuous component, while discrete mathematics is represented only fragmentarily. At the same time, international experience demonstrates the growing importance of discrete structures, algorithmic thinking, and data science in mathematics education. The expediency of introducing three cross-cutting content strands—graph theory, combinatorics and algorithms, and discrete processes and coding—has been substantiated. Their gradual implementation may contribute to the development of students' logical, structural, and algorithmic thinking and ensure a more

balanced representation of continuous and discrete mathematics within the school curriculum.

Prospects for further research are associated with the development of a methodological framework for implementing the proposed content strands, the creation of appropriate teaching materials, and the conduct of pedagogical experiments aimed at evaluating their impact on students' learning outcomes.