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FROM THE HISTORY OF MATHEMATICS TEACHING METHODOLOGY

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Abstract

The article talks about the methodology of teaching mathematics and its history. In order to reveal the topic of the article, the scientific developments of scientists who conducted scientific research on this topic were used.

Keywords: mathematics, education, methodology, school, mathematical education.

For a long time, the history of mathematical education was not a special object of scientific research, and its individual facets were covered either within the history of the development of various educational institutions, or in the context of the history of mathematics, or against the background of materials devoted to personalities. Therefore, it is gratifying to note that at the turn of the 20th-21st centuries, fundamental works on the history of teaching mathematics in Russia by Yu.M. Kolyagin and T.S. Polyakova were published [3].

Despite the uniqueness of these works, it should still be noted that, due to the tasks set by the authors, they describe the history of Russian mathematical education as a whole. Meanwhile, the history of teaching specific disciplines is no less interesting: arithmetic, algebra, geometry, etc. It is all the more important to study the evolution of teaching higher mathematics at school, since the presence of this section in the school curriculum for centuries has caused the greatest number of disputes among teachers. Even today it seems very difficult to get unambiguous and exhaustive answers to traditional questions: "Is higher mathematics necessary in school?", "What questions of higher mathematics should be reflected in the school curriculum?", "How to introduce elements of higher mathematics into school?" and, finally, "How to effectively organize the learning process?". But, despite the difference of opinions, elements of higher mathematics have already become an integral part of the school mathematics course. It must be admitted that the division of mathematics into higher and elementary is very conditional. Indeed, one of the most important objects of the course of higher mathematics are functions that can be considered in parallel in the course of elementary mathematics. More significant is the difference in the methods of studying functions (unlike elementary, higher mathematics makes extensive use of the concepts of limit, derivative, and integral). Historically, the term "higher ("higher") mathematics began to be used as early as the 18th century. (Chr. Wolf, P. I. Gilarovsky and others) to designate two sections: analytic geometry and analysis of infinitesimal numbers. At present, in the Mathematical



Encyclopedic Dictionary, higher mathematics is defined somewhat more broadly - as "a set of mathematical disciplines included in the curriculum of technical and some other educational institutions." In the case of such an interpretation, the course of higher mathematics is formed by elements of analytic geometry, linear algebra, differential and integral calculus, and the theory of differential equations. As you can see, the content of the subject of higher mathematics has undergone certain changes over the past two hundred years.

A detailed analysis of the historical-pedagogical and methodological-mathematical literature suggests that the information given in it does not even give a general picture of the formulation of the teaching of elements of higher mathematics in the 18th-20th centuries. both in higher and secondary schools; all this information is very fragmented, not systematized, there are discrepancies in dates, description of facts, assessment of events. Require clarification, for example, numerous facts about the life and scientific activities of such teachers-mathematicians as S.K. Kotelnikov, M.G. Popruzhenko and many others; there are discrepancies in the timing and reasons for the penetration of elements of higher mathematics into the school curriculum; there is a reassessment of the role of teachers "in the struggle" for the introduction of the ideas of higher mathematics in secondary school, etc. [12].

This can be largely attributed to other sections of the school mathematics course. Thus, there is every reason to state that the contradictions between:

- The preservation of the traditions of the domestic system of mathematical education and the need to update it, caused by the requirements of the time (including in the context of the modernization of secondary schools);
- The actual penetration of elements of higher mathematics into the school curriculum and the lack of a unified theory that justifies the need to study higher mathematics in high school;
- The historical, cultural and pedagogical need to comprehend the historical experience of teaching higher mathematics in secondary school and the lack of knowledge about this important section of the history of mathematical education (including its insufficient coverage in scientific research).

The history of the development of mathematics is not only the history of the development of mathematical ideas, concepts and trends, but it is also the history of the relationship between mathematics and human activity, the socio-economic conditions of different eras.

The formation and development of mathematics as a science, the emergence of its new sections is closely related to the development of society's needs for measurements, control, especially in the fields of agriculture, industry and taxation. The first areas of application of mathematics were associated with contemplation of the stars and agriculture. The study of the starry sky made it possible to build trade sea routes, caravan roads to new areas and dramatically increase the effect of trade between states. The exchange of goods led to the exchange of cultural values, to the development of tolerance



as a phenomenon underlying the peaceful coexistence of different races and peoples. The concept of number has always been accompanied by non-numeric concepts. For example, one, two, many... These non-numerical concepts have always protected the realm of mathematics. Mathematics gave a finished look to all the sciences where it was applied. In Europe, there is a division into the humanities and natural sciences according to the degree of influence of mathematics on these parts. Before teaching mathematics at school, in addition to the general goals of teaching, there are also specific goals determined by the characteristics of mathematical science. One of them is the formation and development of mathematical thinking. This contributes to the identification and more effective development of the mathematical abilities of schoolchildren, prepares them for creative activity in general and in mathematics with its many applications in particular.

In general, the intellectual development of children can be accelerated in three directions: the conceptual structure of thinking, speech intelligence and the internal plan of action.

A solid assimilation of knowledge is impossible without the purposeful development of thinking, which is one of the main tasks of modern school education.

I would like to draw attention to two main problems of mathematics didactics: modernization of the content of school mathematical education and improvement of the course structure.

The rapid growth of the amount of scientific information, the limited period of schooling and the impossibility of reducing the amount of basic science studied at school in order to include new information complicate the reforms to modernize school education, and therefore they will have to be prepared for a longer time, carefully and strictly on a scientific basis.

There are successful experiments to modernize the primary school course and study the principles of algebra in it, which made it possible to give significant propaedeutics of algebra and geometry in grades I-V, which makes it possible to study the systematic courses of these subjects at a faster pace and transfer a number of topics from the senior classes to the middle ones; include elements of higher mathematics in the high school curriculum. Thus, the improvement of the exchange rate system is also possible in the period between reforms, i.e. regardless of the modernization of education.

The word "method" in translation from ancient Greek means "a way of knowledge", "a way of research". A method is a way to achieve a goal, to solve a specific educational problem. There are different points of view on the content of the concept of "methodology". Some, recognizing the methodology as a pedagogical science, considered it as particular didactics with teaching principles common to all subjects. Others considered the methodology to be a special pedagogical science, solving all the problems of teaching and developing the personality through the content of the subject. Let us give some examples of definitions. Methods of teaching mathematics - the science of mathematics as an educational subject and the laws of the process of teaching



mathematics to students of various age groups and abilities. The methodology of teaching mathematics is a pedagogical science about the tasks, content and methods of teaching mathematics. She studies and researches the process of teaching mathematics in order to improve its effectiveness and quality. Mathematics teaching methodology addresses the question of how mathematics should be taught. Methods of teaching mathematics - a section of pedagogy that studies the patterns of teaching mathematics at a certain level of its development in accordance with the goals of teaching the younger generation set by society. The methodology of teaching mathematics is designed to explore the problems of mathematical education, teaching mathematics and mathematical education. The methodology of teaching mathematics is a pedagogical science and, accordingly, an academic discipline that studies the patterns of teaching mathematics in general, the patterns of teaching mathematics at school in particular (5), the science of mathematics as an academic subject and the patterns of the process of teaching mathematics to students of various age groups at a certain level of its development in accordance with the learning objectives set by society[14].

The methodology of teaching mathematics deals primarily with the study, development, improvement of various methods and forms of teaching mathematics in schools, as well as various organizational issues that arise when these methods and forms are applied in practice. This discipline finds out how to provide strong systematized knowledge and skills in the amount established by the program, spending a minimum of time and effort on it, and how to ensure the achievement of those educational goals that the study of mathematics sets itself. The methodology of teaching mathematics studies and systematizes the experience of the best teachers and enables the novice teacher to avoid many mistakes that are easily made at first and lead to great losses for students. Based on the specific tasks facing the teacher of mathematics, having a class with a certain composition of students, a certain program, certain textbooks, a fixed schedule, the methodology establishes ways to make the best use of all these specific conditions to achieve the goal. In addition, she also accumulates the experience of teachers, speaking about the desirability of certain changes in curricula, programs, and textbooks. The methodology of mathematics is a science, the conclusions of which are immediately and widely applied in practice and are the basis of the art of teaching.

The methodology of teaching mathematics must first of all answer several basic, closely related questions. The first one is why teach mathematics? Obviously, the answer to this question can be obtained on the basis of the general tasks of education, which, in turn, are determined by the tasks facing society at the corresponding stage of its development. The second question is who to teach mathematics? On the one hand, this is a question of age: when is it appropriate to start teaching children mathematics and when should they finish studying a compulsory program for all? On the other hand, this is the question of the "after-school" continuation of mathematical education, which is becoming increasingly important. The third question is what is the content of the mathematics course being studied? The answer to this question is closely related to the answer to the



question about the goals of teaching mathematics. It should be emphasized that, perhaps, it is in mathematics that the question of what exactly and to what extent should be selected from today's science for the school curriculum is the most complex, important and controversial. Finally, the fourth question is how to teach mathematics? It is obvious that the answer to this question is the most important part of the course in the methodology of teaching mathematics, and this material is the most mobile, the most specific, the closest to the practical teacher, and requires a truly creative attitude.

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