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Method of Developing Training Mathematics in Academic Lycees

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Annotation: *the article deals with the problems of the methodology of developing the teaching of mathematics in academic lyceums.*

The theory and methodology of teaching mathematics pays more and more attention to the task of developing students, to mathematical education. This is evidenced by a gradually changing view of the methodology of teaching and the associated changing name of this science: the methodology of mathematics (the path to mathematics) - the didactics of mathematics tics (teaching mathematics) - the pedagogy of mathematics (the education of mathematics), the modern general education program among the main learning goals indicates "the intellectual development of students.

The problem of the development of students in the process of mastering them with mathematical knowledge was given constant attention by the great mathematicians, psychologists, and mathematicians-methodologists. The mathematician and pedagogue G. Freudenthal writes about mathematical education: "The main thing that is absent both in elite and in mass mathematical education is the place of mathematics education in the general system of education and upbringing."

The great importance to the development of students in the process of teaching mathematics was given by the well-known mathematician, teacher A.I. Markushevich. In his opinion, it is impossible to reduce the whole problem of mathematical education in the school to transfer to students only a certain amount of knowledge and skills. This would naturally limit the role of mathematics in general education. No less important is the task facing the teacher - the mathematical development of students. Some teachers believe that mathematical development is something derivative, something that accompanies the process of assimilation of facts and skills in the field of mathematical science. A person will pass through a certain number of formulas, definitions, the theory, solve so many hundreds of problems from the math problem-that will acquire the necessary development. It is worth to reduce this amount of knowledge and skills, and the previous development can no longer be guaranteed. This position is fundamentally erroneous. There is no doubt that acquaintance with mathematical facts, analysis and assimilation of mathematical theory, the derivation of formulas, the solution of a considerable number of exercises, develops the abilities of a person and has a certain influence on the formation of his personality, but these means, especially traditional means, to which some schools the task of mathematical development and education, to the extent that is required in modern conditions, in modern society, can not be ensured. And here is one of the weak points of the teaching of mathematics in our school, the overcoming of which should focus attention.

If the mathematical theorems and formulas are not used in human activity, it is not necessary to solve everyday equations, transform trigonometric expressions (and there are still few such professors), then the facts on the assimilation of which he spent a long time in school are very quickly lost.

Speaking of developing training in mathematics, we must distinguish the direction of development of the trainee. What should the student develop? As a rule, the general answer to this question is to develop mathematical thinking. Whether this is so, you can only find out by deciding on the idea of mathematical thinking, its features. In methodical-mathematical and psychological-pedagogical studies, at least three significant approaches to this question can be singled out.

Proponent of the first approach (mathematicians J. Adamar, B.V. 1gied LN-ko, AN Kolmogorov, YP Khinchin, AI Markushevich, Methodist SI Shvartsburg, psychologists NA Menchinskaya, A Kovalev, VN Myasishchev, VG Krutetsky) mathematical thinking is associated with the specialty of the subject of mathematics and with the peculiarities of its abstractions (mathematics studies spatial forms and quantitative relations). Among the characteristic features of mathematical thinking, they distinguish its breadth and flexibility, the propensity to operate with numbers and signs, to solve mathematical problems, the ability to produce abstractions, the ability to correctly build logical reasoning. In the works of these authors the problem of mathematical thinking is closely related to the problem of mathematical abilities, they are often considered as a single problem.

H, B. Mstelsky, having analyzed 20 independent views of the first approach to solving the problem of the structure of mathematical abilities and mathematical thinking, established a list of 30 components of mathematical abilities in them, among which 9 components are repeated three to thirteen times for different authors. By the number of repetitions they are arranged as follows:

- ✓ the power of abstraction, the operation of abstractions;
- ✓ spatial factor (geometric intuition);
- ✓ clear logical reasoning;
- ✓ flexibility, selectivity of thinking;
- ✓ mathematical intuition;
- ✓ computing, digital factor;
- ✓ analysis, synthesis;
- ✓ the desire for rationality of solutions;
- ✓ generalization, finding a similar in different.

Among other abilities to mathematics are called; deductive, inductive, combinatorial thinking; mathematical memory and speech; accuracy of symbols; patience in solving problems; the ability to apply mathematics, perform non-standard algebraic transformations, schematize, operate on folded structures, inclination and interest in mathematics; volitional activity and efficiency, depth, criticality, clarity, laconism, originality. When enumerating such a huge number of distinctive qualities, the specificity of mathematical thinking is lost. It is unlikely that most of them will be considered only to mathematical thinking. The ongoing wide

mathematization of the sciences has led to the fact that many of the above features of the mathematical style of thinking have become inherent in the style of many other sciences.

Apparently, therefore, representatives of the second approach (K. Strunz, L.S. 1 reg.) Deny the specificity of mathematical thinking. Thus, L.S. Tregub believes that the methods of cognition underlying mathematics are common methods of human cognition. In his opinion, "these concepts (set, mapping, transformation, group transformation, symmetry, relation, equality) are schemes that reflect the modeling of the basic techniques of our knowledge in general." Using the example of Erlangen's Klein program, he tries to show that geometry is one of the areas of human cognition in general, and it has uniform methods of thinking, which means that there are no special methods characteristic of mathematical thinking.

The third approach is presented by J. Piaget and his supporters. He claimed that in pre-school and schoolchildren, children develop such operator structures of thinking that allow to evaluate the fundamental characteristics of classes of objects and their relations. Already at the stage of specific operations (from 7-8 years), the child's intellect acquires the property of reversibility, important for understanding the content of mathematics. Piaget associates these operator structures with the basic mathematical structures (algebraic, topological, order), isolated in the mathematics of N. Bourbaki. Mathematical structures are formal "continuation" of operator structures of thinking. The basis of this correspondence is the genetic relationship of the mathematical and operator structures, and a source of this kind is a special type of abstraction-an abstraction of actions.

The point of view of the psychologist LM is close to the third approach. Fridman, who believes that the specifics of mathematical thinking should be sought not in its methods, which are in fact widely used now and therefore receive the status of universal methods of cognition, but in its objects. Mathematical objects are deprived of any material and energy characteristics and have only one characteristic: these objects are in certain relations with each other, in the relations of quantitative, spatial and similar. Consequently, in the opinion of L.Ya. Friedman, mathematical thinking is an extremely abstract theoretical thinking whose objects are devoid of any materiality and can be interpreted in the most arbitrary way, provided that the relations between them are preserved.

Such a spectrum of views on mathematical thinking, the structure of mathematical abilities speaks of the difficulty, the multivalence of the problem of the development of mathematical thinking. Among the main reasons for the difficulties in solving the problem is the fuzzy understanding of the object of study, which leads to a mixture of educational-mathematical and scientific-mathematical abilities.

An understanding of the category of "mathematical thinking", the disclosure of the interrelationships between educational-mathematical and general educational abilities would help to elucidate the question: what other specific cognitive types of thinking, mentalities, what are their interrelations.

From the subject abilities of schoolchildren, the creative abilities formed in the process of teaching physics are thoroughly thoroughly studied. Razumovsky, who reveals the essence of the concept of "physical thinking. Geographers have introduced into their vocabulary the term "geographical thinking. If such thinking exists, then its levels are individually different, and therefore geographic abilities must exist. And do they exist? Are there special special abilities for each subject and activity? Can we talk about a special type of thinking?

We agree with the assumption of N.V. Metelsky that there is no specific thinking for each area of knowledge and type of activity. From this point of view, it becomes obvious that the teacher should develop the general that is inherent in thinking in any subject area. These are, cognitive structures, and the main directions of their development - the formation of students' cognitive interest, the skills of the heuristic activity and creative experience.

And the field of intellectual activity and academic subjects can probably be grouped so that for each group certain qualities of thinking will be characteristic. Among these groups, a group of mathematical sciences is striking and original, attracting the attention of mathematicians, psychologists and teachers, and it allows us to talk about mathematical abilities, mathematical style of thinking, mathematical culture and its formation. In connection with what has been said, the task of forming a mental culture of thinking in the process of teaching mathematics is important. A.M. Friedman detects the signs of a culture of thinking - intelligence, logic and discipline.

The study of VN, Osinskaya is devoted to the formation of the intellectual culture of students, receptions of mental activity in the process of teaching mathematics. It attaches special importance to generalized methods of mental activity, classifying them into two groups - algorithmic type and heuristic type. She refers to the first methods of reasoning, correct thinking, fully conforming to the laws of formal logic, for example, algorithms for solving typical problems, rules for constructing the definition of a concept through generic differences, etc. These techniques are important because they serve as a background for knowledge on based on which the student can solve new problems for him, master more complex methods of thinking activity.

However, long exercises in solving problems based on algorithms form an installation for action on a ready-made model, restrict the search by the frames of already known techniques, "create a barrier to past experiences, its interference in a new situation." Therefore, the formation of such reception should be combined with special training for heuristic-type devices. To the basic heuristic methods In. Osin-skaya attributed the comparison, highlighting the main, generalization and gave a detailed method of forming these techniques.

The development of students, as we have already found out, is closely connected with the process of learning. What does it involve teaching math? A.A. Stolyar believes that the task of the pedagogy of mathematics is to form and develop those structures of mental activity that are characteristic of mathematical thinking (or thinking) of mathematicians. He proceeds from the fact that teaching mathematics is the training of mathematical activity.

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