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Solving Mathematical Problems as a Method of Developing the Thinking of Primary School Students

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ABSTRACT: The article deals with topical problems of logical thinking, despite the fact that there are many studies on this issue in psychology. It is believed that an important stage in the purposeful formation of creative learning is the primary school age: 5-11 years. The author of the article gives the concept that through a system of mathematical exercises with a logical load, it is possible and necessary to develop the logical thinking of students of secondary schools at the stage of motivation when studying a new topic, while generalizing and systematizing knowledge.

KEYWORD: individual features of teaching, development of logical thinking, pedagogy, psychology.

Introduction. The need of modern society for specialists who own methodological, systemic and creative thinking actualizes the question of a scientifically based system for the formation of these types of thinking. An extremely important stage in the purposeful formation of creative thinking in the learning process is the primary school age. In modern developmental and educational psychology, the problem of developing the thinking of a younger student occupies one of the central places. And this is not accidental, since the data of psychological and pedagogical research indicate that thinking develops most actively during the period of primary school age. There is no unequivocal answer to the question about the criteria for the development of creative mathematical thinking in children of this age. It should be noted that recently there have appeared original methods aimed at the development of creative mathematical thinking, but in these methods the authors use not the main, but additional material in the school curriculum [4, 5, 6].

Based on the analysis of psychological and pedagogical literature and taking into account the existing practice of primary mathematics teaching, it was concluded that there is a contradiction between the society's need for creative individuals and the insufficient development of means of influencing the development of creative thinking, especially at the initial stages of education [1, 2, 5]. The existing developmental learning technologies are mainly aimed at the formation of verbal and logical thinking, while the possibilities for the development of creative thinking remain insufficiently studied. Also, the problem of developing creative thinking in the process of solving arithmetic problems remains insufficiently studied, and the problem of solving typical problems in various ways as one of the means of developing creative mathematical thinking remains open. Thus, the problem of the development of creative mathematical thinking in primary school age requires further study. We chose this problem as the topic of our study [3, 7, 9].

Practice shows that it is impossible to teach everyone, without exception, at a high level, there are good arguments for that: children are distinguished by their ability to rational thinking, attention, memory properties. A child who has unstable attention, memory is not developed, will not be able to perform even

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some of the traditional tasks. It's not customary to talk about it, but it's true. And no matter what new pedagogical technologies are used, such children are distinguished by low academic performance [8, 10, 11].

The ability to think logically is characterized by the ability to perform certain actions in various conditions. A feature of logical skills is that the student must not only analyze, synthesize, compare, abstract, generalize, but also think, draw conclusions, establish causal relationships between facts, processes, phenomena, coordinating them with the laws of logic [12, 13, 14]. Therefore, the process of formation of logical skills involves the implementation of certain successive stages. This is due both to the level of general preparation of children, the complexity of the educational material, and to the peculiarities of thinking of children of the corresponding age group [15, 17].

One of the most influential means of forming the logical thinking of students is a system of exercises with a logical load. The concept of "a system of exercises with a logical load" should not be understood as only solving problems or exercises with a logical load [16]. This is a purposeful system of the teacher's work on the development of students' logical thinking at each stage of the lesson. The experience of the teacher shows how, through a system of exercises with logical loads, it is possible to develop the logical thinking of schoolchildren at the stage of motivation, when checking homework, when studying a new topic, when generalizing and systematizing knowledge, skills and abilities, both at the end of the lesson and at the end study section.

Psychological studies of creative mathematical processes mainly concern the study of thought processes associated with the solution of mathematical problems and with mathematical creativity. These studies can be divided into two groups: scientific and psychological. Scientific research is characterized by the desire to outline the "subject of creative mathematical thinking", and for psychological research - to clarify the procedural, dynamic and content aspects of creative mathematical thinking.

Mathematical thinking is identified with a special way of reasoning, which has logical, spatial, symbolic, numerical and intuitive components. The number of stages of creative activity does not coincide with different researchers, but their content turns out to be more or less the same: the preliminary stage (the discovery of reality, the perception of problems, the definition of the problem to be solved, the formulation of hypotheses); incubation (stage of search for solutions); intuition (the stage of redesigning existing knowledge); critical review of what has been achieved, finding a solution to the problem, control.

Thus, we can state that most authors recognize the specific features of mathematical thinking. This specificity is associated with the use of mathematical symbolism, logical proof in solving a mathematical problem, algorithmization of problem solving, simultaneous use of axiomatic and constructive methods, construction of mathematical models, creation of mathematical theories.

An analysis of the literature shows that, despite significant developments in the content of the mechanisms of creative mental acts, there is no consensus on the nature of creative thinking. As you know, individual thinking skills are formed spontaneously if a person has a sufficiently rich life experience. However, most students do not have this experience. Students do not automatically acquire thinking skills. Therefore, the ability to sift information, check it for reliability and significance, ignore irrelevant, devalued information is necessary for a modern person to achieve success in the world. It is possible to single out the main goal of the school, which is to develop in students the ability to manage the processes of creativity: fantasizing, understanding patterns, solving complex problem situations.

The development of students' thinking has always been in the center of attention of psychologists and teachers. According to E. Revin, thinking is the highest degree of human knowledge of reality. Sensual basis of thinking are sensations, perceptions and representations. Through the sense organs, which are the only channels of communication between the body and the outside world, information enters the brain. The

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content of information is processed by the brain. The most complex (logical) form of information processing is the activity of thinking. Solving mental and life problems, a person argues, draws conclusions and thereby cognizes the essence of things and phenomena, discovers the laws of their connection, and then transforms the world on this basis. Thinking is closely connected with sensation and perception, and is formed on their basis. The transition from sensation to thought is a complex process, which consists in isolating and separating an object or its signs and separating it from a specific one, and establishing a common thing for objects.

Thinking is activated when a person has questions that cannot be answered by perceiving objects, reproducing what is already known about them. The moment of thinking is the posing of questions: "What is this?", "Why is this so?", "Who is to blame?", "What to do?" Therefore, the development of the child's logical thinking is a process of transition of thinking from the empirical level of cognition (visual-effective thinking) to the scientific and theoretical level (logical thinking), with the design of the structure of interrelated components, logical thinking techniques (logical skills), which ensure the holistic functioning of logical thinking.

Thinking is a person's mediated and generalized knowledge of objects and phenomena of objective reality in their essential connections and relationships. It is in the process of mental activity that a person cognizes the world around him with the help of special mental operations. The basic structures of thinking are formed in 5 - 11 years. Therefore, the logical preparation of the child must be carried out from elementary school. Human thinking not only includes various operations, but also proceeds at different levels, in different forms, in the aggregate, it allows us to speak about the existence of various types of thinking: theoretical (conceptual, figurative) and practical (visual-figurative, visual effective).

Note that the listed types of thinking act simultaneously as levels of its development. Theoretical thinking is considered more perfect than practical, and conceptual thinking represents a higher level of development than figurative. Emphasizing the importance of mathematics in the education of logical thinking, scientists highlight the general provisions for the organization of such education: the duration of the process and the daily implementation of the education of a culture of thinking; the inadmissibility of errors in the logic of presentation; attracting children to improve their thinking, a personally significant task for children; inclusion in the content of training of a system of theoretical knowledge about the methods of orientation in the performance of mental actions.

To make students more easily aware of the connections and dependencies between the numbers of the problem, special tasks of functional content are needed, which are divided into three groups:

- exercises (using analogy, eliminating the superfluous, with a chain of words, cutting figures, with numerical expressions and actions);
- tasks (weight and weighing, geometric, quick wits, with a natural plot, with a logical load, economic content);
- non-traditional forms (anagrams, labyrinths, crossword puzzles).

Problem solving - exercises that develop thinking. Moreover, solving problems contributes to the development of patience, perseverance, will, helps to awaken interest in the very process of finding a solution, and makes it possible to experience deep satisfaction associated with a successful solution. The very process of solving problems with a certain methodology has a very positive effect on the mental development of schoolchildren, since it requires the performance of mental operations: analysis and synthesis, concretization and abstraction, comparison, generalization.

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So, when solving any problem, the student performs analysis: separates the question from the condition, highlights the data and the desired numbers; outlining a plan for the solution, he performs a synthesis, using concretization (mentally draws the condition of the problem), and then abstraction (distracting from the specific situation, chooses arithmetic operations); as a result of multiple solving problems of any kind, the student generalizes knowledge of the relationships between data and the desired in problems of this type, as a result of which the method for solving problems of this type is generalized.

Conclusions. Logic exercises significantly help the teacher to develop in students all mental operations, a search-transformative style of thinking, to bring up the motivation to achieve success, which is necessary for everyone both in school and in life. Teaching mathematics should contribute to the formation of a culture of thinking in schoolchildren, namely:

- research interest, desire to search;
- analytical mind, logical thinking;
- flexibility of thinking, independence, criticality.

The variety of ideas and theoretical approaches in the study of the mechanisms of formation, development and functioning of creative thinking gives the impression of uncertainty and inconsistency even within the same area of research. The leading psychological directions in the study of the problem of creative thinking is the study of its procedural-dynamic aspect and individual differences. In modern psychological and pedagogical literature, the problem of methods, means, content and conditions for the formation of creative thinking at the initial stages of education, in particular mathematics, is presented extremely insufficiently, which in general causes the indicated contradiction.

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