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## Developing Logical Thinking of 5-9th Year Students at Mathematics Lessons

**Key words:** *development, lesson, mathematics, logical thinking.*

**Annotation:** *the article deals with the development of logical thinking of pupils of grades 5-9 at math lessons.*

Without the capacity for independent thinking, the intellectual development of the child is hardly possible. That is why the problem of developing the logical thinking of students acquires a special urgency. The problem of the development of logical thinking was investigated by psychologists in the general theory of thinking as scientists A.B. Brushlinsky, J.I.C. Vygotsky, P.Ya. Galperin, A.N. Leontiev, S.L. Rubinshtein, K.A. Slavsky, in the theory of the development of thinking as scientists D.B. Bogoyavlenskaya, L.V. Zankov, H.A. Menchinskaya, Z.I. Kalmykova, T.V. Kudryavtsev, I.S. Yakimanskaya. Among foreign psychologists who devoted a lot of work to these questions, it is necessary to mention J. Piaget, E. de Bonet.

In the studies of modern psychologists (P.Ya. Galperin, N.F. Talyzina, and others), it is convincingly shown that general methods of intellectual activity should appear in the learning process as a matter of special assimilation and formation. Such scientists as I.Ya. Lerner, I.L. Nikolskaya, N.P. Partiev, H.A. Podgoretskaya, A.A. Stolyar and others have theoretically and experimentally proved that the school does not provide students with the necessary level of development of logical thinking. The importance of the logical developed students in the transition from primary to secondary school is proved by the studies of many psychologists, teachers, methodologists (E.P. Malanyuk, A.B. Zaporozhets, H.A. Mechinskaya, V.A. Fil, etc.).

According to the data of psychological and pedagogical studies, the maturation of the right hemisphere at a younger age is at a faster rate than the left one, and therefore in the early period of development, its contribution to psychological functioning exceeds the contribution of the left hemisphere, it is even claimed that up to 9-10 years the child is right-hemisphere creature. Such an assessment is not without grounds, since it corresponds to certain features of the mental development of children in preschool and early school age. At the age of 10-11 years, changes occur in the brain, the left hemisphere begins to develop more quickly. A characteristic feature of adolescence is the ability to think logically, to reason, to use concepts.

Psychological and pedagogical studies of schoolchildren's educational activity show that the content of the educational material, its correspondence to the psychological development of the child, has a great influence on its results. This involves the formation of training courses, taking into account, first of all, the psychological characteristics of schoolchildren of a certain age group (I.K. Amonov, T.V. Bashaeva, D.N. Bogoyavlensky, H.A. Menchinskaya, L.I.

Bozhovich, G.V. Egorova, V.A. Yeroenko, M.V. Marton, A.Z. Zak, and others). Diagnostic studies have shown that the students' knowledge of methods and methods for solving mathematical problems is not enough (E.V. Veselovskaya, V.N. Druzhinin, E.P. Kolyada, G.V. Krasnoslobotskaya, V.P. Ozerov, O.V. Solovyeva, L.F. Tikhomirova, A.B. Basov). In studies, methodologists have established that schoolchildren use in their learning activities basically learned techniques for solving certain tasks, do not think about the meaning of the operations performed (on any control work in the 5- The sixth grade is the most successfully solved examples, the same problem often with tavit even in the dead end of strong students). One of the main reasons for this is the lack of continuity in the selection of teaching material and methods of conducting lessons between primary and secondary schools (I.V. Goncharova, JI.B. Zevin, G.V. Ovsinko, TI Plotnikova, V.N. Rudenko). Significant deficiencies are also revealed in the content of the educational material, as a result of which there is a weak development of logical and combinatorial ways of thinking (E.V. Veselovskaya, V.N. Druzhinin, B.C. Egorina, M.A. Ekimova). A lot of research is devoted to the special logical preparation of schoolchildren in both primary and secondary schools, searching for ways to develop students' logical thinking in the process of teaching mathematics (A.K. Artemov, I.L. Nikolskaya, A.A. Stolyar). They developed common programs, content and, in part, the method of logical preparation of schoolchildren in the process of teaching mathematics. The results of the research of these authors were concretized with reference to various levels of study in secondary school, to various mathematical disciplines, to individual subjects in the works (K.O. Ananchenko, E.P. Kolyady, T.A. Kondrashenkova, G.V. Krasnoslobotskaya, L.A. Latotin, L.N. Udovenko, and others). In the works of many researchers, special attention is paid to the formation of such ways of thinking as classification, inference, etc. Alekseeva conducted a study on the formation of logical thinking in the course "Logical literacy" in primary school. However, the practical use of the results of the research of the above authors is hampered by the lack of a course of "Logical literacy" in primary school (O.V. Alekseyev), continuity between the curricula in the transition from primary to secondary school, and objective difficulties in using author's programs in a mass school. The need to further develop the problem of forming the logical thinking of younger adolescents is emphasized in the studies of many scientists (A.B. Nikolaev, A.K. Artemov, I.L. Nikolskaya, A.A. Stolyar, K.O. Ananchenko, E.P. Kolyada, T.A. Kondrashenkova, G.V. Krasnoslobotskaya, L.A. Latotin, B.C. Nodelman, B.C. Nurgaliev, B.D. Payson, L.N. Udovenko, O.V. Solovyov, and others). In our republic, the development of mathematical thinking in academic lyceums as scholars B.S. Abdullaev, etc. Therefore, in our study, we tried to identify a set of didactic conditions that ensure the possibility of effective development of the logical thinking of adolescents who can be used in a school where mathematics is taught on the most common textbooks. In addition, we have developed a special methodology that meets the proposed set of conditions and aims at comprehensive training in the methods of logical thinking.

Analysis of the educational systems of school mathematics courses allows us to distinguish between the contradictions between:

- the requirements for the results of the training activities of fifth graders and a large amount of educational material, which is why many students, not having mastered one topic, go to the other with significant gaps, which is absolutely unacceptable in the study of mathematics;

- the level of development of logical thinking of schoolchildren of the age group under study and the need for mastering them with methods of abstraction, analysis, synthesis, classification for solving certain mathematical problems.

In our opinion, it is necessary to develop a set of didactic conditions that ensure the development of logical thinking among junior students in the process of studying mathematics.

According to our research, the content and structure of the system of tasks designed to develop the students' logical thinking by means of mathematics in the conditions of transition from primary to secondary school are developed and scientifically substantiated; didactic conditions for the effective development of the logical thinking of younger adolescents in the lessons of mathematics were identified and grounded, methodological principles of the development of logical thinking for schoolchildren of the 5th grade were formulated corresponding to this complex (combining, complementarity, adequacy of requirements and loads of shifts in interhemispheric asymmetry of the brain, .); the developed author's training course of mathematical problems and an adequate mechanism for its implementation in the educational process of the school make a significant contribution to the development of the logical thinking of junior students.

Practical significance of our research: The developed set of didactic conditions for the development of logical thinking among junior students is adapted to the conditions of the secondary school educational process. The author's methodology is proposed, which allows students to develop logical thinking in the framework of the existing mathematics programs (grade 5). The results of the research and the methodological materials developed in its course can be used in the practice of teachers of the general education school.

Particular attention is paid to the didactic bases of the formation of thought operations in the learning process, the didactic conditions for the development of the logical thinking of junior students are analyzed and singled out. From the analysis of psychological and pedagogical literature on the research problem, it follows that the discrepancy between the level of development of logical thinking of younger adolescents and the curriculum requirements is largely due to the lack of a systematic approach to the didactic conditions accompanying the learning process in the fifth grade. Practice shows the connection between the possession of mental operations and the success of schooling. Systematic work on the development of logical thinking determines the reality of the transfer of skills when solving specific study assignments for other school subjects.

Modern trends in the development of the educational process are characterized by a systematic approach to its various components. Didactic systems are considered as a reciprocal unity of all components. A systematic approach to the allocation of didactic conditions that ensure the effective development of the logical thinking of students-younger teens poses the task of determining the stable and essential elements of the system. With reference to pedagogy, this should be didactic means and methods. Didactic conditions are the learning circumstances, which are the result of selection, design and application of content elements, forms, methods and means of teaching that contribute to the effective solution of tasks.

In pedagogical studies in recent years, various sets of didactic conditions for the development or formation of logical thinking of students have been singled out. Taking into account the experience of scientists and educators, we developed a set of didactic conditions, including, in our opinion, the learning circumstances that were lacking, which contribute to an effective solution of the set tasks.

1. Each lesson should begin with the solution of tasks aimed at activating attention, memory, imagination (in the traditional paradigm - this is the actualization of knowledge, skills or skills).
2. The actualization of a concrete thought process should be associated with a mathematical object (a problem, a numerical series, a graph scheme, etc.).
3. Abstracting from the concrete content of a mathematical problem should be preceded by the solution of a number of tasks with support for visual-effective and visual-figurative thinking.
4. Development of mental techniques should be carried out in a complex.
5. The development of reflection is one of the determining factors for the successful adaptation of fifth-graders to new learning conditions.
6. A special system of mathematical problems is one of the conditions for the process of teaching schoolchildren to the methods of logical thinking.
7. Along with ensuring the unity of the motivational, content and operational components of training, attention should be paid to the development of interest in the subject as the most important motive in the motivational sphere of the student.
8. In the learning process, the principle of variation in the development of logical thinking must be observed, and an individual development trajectory must be constructed.

Support in the development of logical thinking is the development of such mental processes as memory, perception, imagination. In each lesson, it is necessary to "lose" three mini stages of knowledge of the world: visual-effective, visual-figurative and abstract-logical. The activities of students should be accompanied by a positive emotional background. The formation of mental operations is carried out on a specific mathematical material, which is a mandatory content of the school curriculum.

Before starting to perform a mental operation, the student must, through memory, imagination, actualize the practical experience associated with a particular operation. An important role here can be played by perception through sensations, that is, a visual and effective study of the object can be included.

After this, the student's thinking activity is stimulated by various means and methods, accompanied by a positive emotional background, fixed in the form of material images, realized in practical actions.

Only after such preparation there is a transition to the mathematical content, its integral picture is recreated. At this stage, elements of integrative technology are introduced into the activities of students. Independent activity is carried out according to a known norm, that is, a mental

operation is performed with the help of visual-figurative and visual-effective components of thinking. Further, the activity is reconstructed according to a known norm, namely, performing a mental operation without reliance on visual images.

When generalizing and consolidating the ability to perform mental operations with the help of a system of mathematical tasks, the skill becomes a skill, and accordingly, a departure (criticism) from a known norm.

In conclusion, analysis of psychological pedagogical studies, practical performance of educational institutions has shown the existence of contradictions between the emerging requirements for mandatory learning outcomes and the development of logical thinking of students between the large amount of information offered by the student and the inability to quickly produce its analysis, the main highlight, compare data. This again proves the urgency of the problem of the development of logical thinking in the process of training in the mass school. To develop the logical thinking of fifth-grade schoolchildren in the process of teaching mathematics, a set of didactic conditions was developed that includes both a theoretically grounded system of principles, requirements, selection criteria for teaching material, so and a system of mathematical tasks that meets certain requirements.

In addition to a set of didactic conditions, the pedagogical system included a unified methodological line for teaching mathematical material, taking into account various aspects of the age characteristics of students, junior adolescents. As a result of the sessions, positive motivation for studying the subject was developed in the majority of students in the experimental class. The series of studies carried out beneficially affected the level of development of logical thinking, softened the difficulties in getting used to new learning conditions for schoolchildren of the 5th class (internal motivation prevails over the external by 50% in quantitative terms, 45% of students expressed an increased interest in such a subject as mathematics in the result of open questioning, more than 80% experienced psychological comfort in studying this subject). As a result of the formative experiment, schoolchildren experienced significant developmental changes in logical thinking, in comparison with the results of the input and the control class students. About 30% of students in the experimental class "moved" to a higher level at the end of the pilot study, in the control class of shifts in this indicator practically did not occur.

### **References:**

1. Kudrina TS. *Development of logical thinking in the dialogue: author's abstract. diss. cand. psychol. sciences. Moscow, 1987; 18.*
2. Kuznetsova EV. *Entertaining tasks as a means of forming the creative activity of students of grades 5-6 in teaching mathematics: author's abstract. diss. cand. ped. sciences. Moscow, 1997; 17.*
3. Orlova E. *Methods for solving some logical problems and problems on numbers: Mathematics, 1999, No. 26; 27-29.*
4. Tikhomirova LF. *Development of the student's intellectual abilities: popular manual for parents and teachers. Yaroslavl, 1997; 66-105.*
5. Tikhonova LI. *Elements of mathematical logic: Mathematics, 2003, No. 27-28; 23 - 28.*
6. Fridman LM. *Psychological and pedagogical foundations of teaching mathematics in school: Teacher of mathematics about pedagogical psychology. Moscow, 1983; 32-49.*

