

THEORY OF SOLVING INVENTIVE PROBLEMS TECHNOLOGY AS A MEANS OF DEVELOPING LOGICAL THINKING IN JUNIOR HIGH SCHOOL STUDENTS

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Abstract. *In the article, special attention is paid to the education of elementary school children in Jahan, to the development of their thinking process. Developed countries such as South Korea, France, Japan, and Germany, along with the development of children's mathematical intelligence, take a serious approach to the formation of freedom of thought in primary educational organizations.*

Keywords: *the theory of solving inventive problems in teaching mathematics to schoolchildren, primary classes, training, education.*

In the modern world, rapid changes are taking place in all aspects of human life, so society needs people who have a creative approach to solving difficult problems. Therefore, along with traditional education, new pedagogical technologies aimed at developing a person's creative direction are increasingly being introduced in schools. An example of such a technology is Theory of solving inventive problems. The theory of solving inventive problems, or Theory of solving inventive problems technology for short, appeared in the USSR at the end of the 40s of the 20th century. The authors of Theory of solving inventive problems are the famous inventor, fantasy writer G.S. Altshuller [1] and his scientific school. The main idea of Theory of solving inventive problems technology is that the search for ways to solve problems should not be a spontaneous, random process, it can be built into a system of logical operations. Originally, theory of solving inventive problems was developed for use in the engineering field, but the principles underlying this technology allow it to be used in pedagogy as well as in many other fields. Adaptation and application of theory of solving inventive problems as a pedagogical method A.A. Demon [10]. In 1989, theory of solving inventive problems technology began to be used in secondary schools. The basis of Theory of solving inventive problems technology is the following components [3]:

1. Methods and technologies aimed at mastering the technique of eliminating psychological inertia.

2. Methodology of problem solving based on the laws of development of systems, general principles of conflict resolution and the mechanisms of applying concrete creative problems in their solution.

3. Educational system based on the theory of creative personality development.

Today, Theory of solving inventive problems technology has proven its effectiveness and is therefore becoming more and more popular among teachers. Its purpose is to form a culture of creative thinking of an individual as a conscious, purposeful and controlled process. Preparing the student to solve new problems. The use of theory of solving inventive problems technology in elementary school classes solves the following pedagogical problems [5]:

1. Development of students' creative abilities.

2. Development of attention, logic, memory and speech.

3. Development of creative and logical thinking.

4. Development of planning and forecasting skills.
5. Development of students' independence and self-confidence.
6. Formation of creativity, ability to solve practical and social problems.
7. Increase the general knowledge level of students.
8. Formation of a positive attitude to educational activities in students.

9. Formation of self-development and self-awareness of students. The basis of theory of solving inventive problems technology is a functional-systemic approach. Its essence is to identify investigative connections and to identify hidden connections. Students analyze situations and objects, organize the received information and draw appropriate conclusions [4].

One of the advantages of this technology is its convenience for children from preschool age. Theory of Solving Inventive Problems includes algorithmic methods of forming a conscious, controlled, purposeful and effective process of mental activity. The presented technology was of particular importance for teachers with a developmental didactic position, because theory of solving inventive problems is not only a developing technology for thinking and creativity, but also contributes to the comprehensive development of students. In order to effectively apply theory of solving inventive problems technology to the educational process, the teacher must carefully study this technology. A.A. Jin [10] defined the following rules for teaching theory of solving inventive problems : before knowledge, surprise is necessary - surprise, inquisitiveness, awakening of questions in the student and interest in finding answers with them, that is, learning; knowledge can become a tool only when it comes to action - if the student has mastered the material well, but cannot apply it in non-standard situations, then he has not mastered the knowledge at a sufficiently high level. If you do not follow these rules, then teaching using theory of solving inventive problems technology will not be effective enough. With the help of theory of solving inventive problems technology, elementary school students learn to find answers from several options and when they are ambiguous. In this process, students use all operations of logical thinking: analysis, synthesis, comparison, generalization, etc.

theory of solving inventive problems technology implies freedom of thought for students; they can say whatever comes to mind - the more ideas the better. Therefore, this technology meets the requirement of creating conditions for the development of logical thinking - encourages students to express their opinion, justify their decision, defend their point of view without fear of making mistakes.

Lessons using theory of solving inventive problems technology become an interesting activity for junior schoolchildren, where children make their own discoveries without realizing that they are learning. The diversity of theory of solving inventive problems forms and methods allows making each lesson unique. theory of solving inventive problems technology teaches children to observe, notice, question, and most importantly, to think boldly.

The structure of the lesson with theory of solving inventive problems technology includes the following stages: motivation, intellectual warm-up, content, puzzle, conclusion. One of the main poles of such lessons is to maintain a stable positive motivation of students for their educational activities throughout the lesson. One of the most important conditions for the development of logical thinking of young schoolchildren is the active involvement of students in research activities. The theory of solving inventive problems technology itself gives lessons an activity-based character: students compare, classify, analyze and synthesize objects, choose bases and criteria for comparing language concepts, establish cause-and-effect relationships in the language, and build logical reasoning chains. In the process of discussing the learning material,

knowledge is revealed and a state of success is created. With the help of this technology, the students learn, plan and predict, self-development and improvement skills [7].

Lessons with theory of solving inventive problems technology can be organized in various forms: individual, pair, group and frontal. With the help of individual work, students have the opportunity to express their individuality, find non-standard solutions, compare their ideas with the ideas of other students. The state of collective interaction allows to activate the mental operations of each student - new ideas of one student stimulate the activity and development of another. Thus, the activity becomes a type of play, and play is the most convenient and interesting activity for young children.

Theory of solving inventive problems has an algorithm for solving problems [2]: 1. Determination of the type of problem: research (description of a new phenomenon that was previously unclear and unknown) or inventive (understandable phenomena that need to be improved or changed). Problem conditions include "how to do this?" a research problem can be turned into an inventive problem by asking 2. Formation of contradictions and the ideal final result. 3. Determination of field resources. Resources are anything useful for finding a solution to a problem. 4. Problem Solving: Applying techniques and principles developed in theory of solving inventive problems to find solutions. 5. Analysis of the solution of the problem from the position of ideality.

Working with this algorithm develops the ability to identify contrasting features and plan creative activities. Contributes to the organization of effective search for solutions. It allows students to perform tasks at a new level of quality. Students who have mastered this algorithm can systematically solve any problem in clear logical steps. O.V. Andreichenko [8] in his article "Using theory of solving inventive problems technology in mathematics lessons in elementary grades" describes the actions of students used to solve more complex problems: they form a contradiction that shows a negative function; form an ideal solution and try to answer the question of what prevents it; create a model of the problem; search for the required resource is carried out; use of conflict resolution methods; organizing a resource of possible solutions; choose the optimal solution.

In the work of L.A. Platonova. [5] pointed out the following difficulties in the application of theory of solving inventive problems technology: the difficulty of mastering the terminology of primary school students and the insufficient development of the educational and methodological base. Therefore, when introducing theory of solving inventive problems technology into the educational process, it is important for the teacher to consider the specific application of this technology. The form of training based on theory of solving inventive problems technology is an educational dialogue based on cooperation between the participants of the educational process. Collaborative pedagogy that allows maintaining an active position between the teacher and the student, which is important in solving theory of solving inventive problems.

Analyzing the work of well-known teachers working with this technology, we identified the following recommendations:

1. Each lesson should be carefully prepared and thought through to the smallest details. It is especially important to correctly calculate the lesson time in order not to violate the integrity of the intended presentation of the material.

2. During the lesson, students should feel freedom of thought. Emphasize the exclusivity of student responses, encourage engagement, and quietly guide student responses in the right direction.
3. Tasks should be presented in an interesting way, for example, in the form of

adventures or fantastic situations. This encourages students to perceive educational tasks as an interesting game, which increases their interest in the educational process.

4. The teacher should not answer for students, students should be led to solve the problem independently. In this way, students develop determination, persistence, independence in finding solutions, and the desire to seek as many answers as possible.

5. The teacher must maintain a sufficiently high pace of training. It helps students to develop the ability to think intensively for a long period of time.

6. The lesson should have "release supplements" so that students can get rid of intellectual stress.

7. Theory of solving inventive problems technology assumes the child's freedom of thought, but children should be taught to think about answer options, and not shout inert solutions.

8. There should be several transitions from one activity to another during the lesson. This helps prevent fatigue and keeps students interested and active in the learning process.

9. Give theory of solving inventive problems lessons an atmosphere of exclusivity and originality, so that each student realizes that he is talented. For example, you can include some traditions. This helps to create a comfortable, comfortable atmosphere in the classroom, increases the self-confidence of students, and also has a positive effect on the cohesion of the class team.

Theory of solving inventive problems technology meets the requirements of the second-generation state educational standards [48]. The implementation of the basic educational program is based on a systematic-active approach, which is one of the mechanisms for implementing this technology. theory of solving inventive problems technology can be applied to the educational process together with various educational programs. The main thing is that the teacher competently builds the educational process, taking into account the characteristics of students, the educational program and the technology itself. theory of solving inventive problems technology has developed a variety of universal techniques that can be used in every academic discipline. The following theory of solving inventive problems methods are mainly used in mathematics classes in primary school: system operator, conventional fantasy technique, dichotomy, systematic elevator, morphological piggy bank, passport creation, small people method, storyboard, methods of creating speech creative products, brainstorming, method of morphological analysis, synectics. These methods are aimed at the rapid development of intellectual abilities of young schoolchildren [4].

The school in which the study was carried out uses the national education program "mother school" [46]. This program contains many principles of the national school, which have proven to be convenient for students of primary school age and take into account the age characteristics of children. The program focuses on personal development education for primary school students. In this educational complex, the development of logical thinking of junior schoolchildren is mainly helped by the problem-search approach. Implementation of this approach involves creating problem situations, reasoning, looking for evidence, forming conclusions, making assumptions and evaluating results. This approach helps to form students' natural motivation to study, to develop students' ability to understand the meaning of the task, plan educational activities, monitor and evaluate its results. The problem-research approach allows to create a flexible teaching methodology adapted to the specific characteristics of the educational content and a specific pedagogical situation, taking into account the individual characteristics of students, their inclinations and interests during the educational process at the school. Thus, the features of the educational program "mother school" do not prevent the use of theory of solving inventive

problems technology in mathematics lessons for the development of logical thinking of junior schoolchildren.

After studying the psychological-pedagogical literature on the research topic, we conducted a pedagogical experiment, which was conducted in three stages: identification, formation and control. 22 students of the 3rd "A" class (experimental group) and 22 students of the 3rd "B" class (control group) of the budgetary educational institution "School No. 93" in the district of Namangan region, New Namangan district participated in the research. At the detection stage, five diagnostic methods were chosen to determine the level of logical thinking of junior schoolchildren: E.I. Rogova, "Sequence of events" N.A. Bernstein, "Learning verbal-logical thinking" E.F. Simple analogies adapted from Zambatsevichene, Y.I. Kulagina and V.N. Kalyutsky, "Comparison of Concepts" L.S. Sakharova - L.S. Vygotsky. According to the results of the identification stage, experimental and control groups were determined, which became 3 "A" and 3 "B" classes, respectively. At the formative stage of the experiment, 10 Russian language lessons were developed and conducted using the theory of solving inventive problems technology aimed at developing the logical thinking of elementary school students. Various methods of theory of solving inventive problems technology were used in the course of the developed lessons. The final stage of the experiment was a control section in order to determine the level of development of logical thinking of elementary school students after conducting a set of developed lessons on Mathematics. The results of the study confirmed our hypothesis, positive dynamics were found in the development of logical thinking of junior high school students of grade 3 "A".

Summary Logical thinking is a type of thinking based on working with concepts, reasoning and conclusions according to the laws of logic. The development of logical thinking in schoolchildren is important at all levels of the educational system, but special attention should be paid to primary school, because logical thinking is a new development at this stage of the child's development.

Therefore, we chose the problem of developing logical thinking of junior schoolchildren for our research work. After studying the psychological and pedagogical literature, it was found that the components of logical thinking are logical operations: analysis, synthesis, comparison, generalization and classification. Logical thinking is built directly on the basis of the sum of these mental operations, so it is important to develop these operations purposefully and systematically as components of logical thinking in students from the 1st grade. Also, the conditions that should be created in the educational process for the successful development of students' logical thinking were defined. One of the technologies contributing to the creation of these conditions is the theory of solving inventive problems technology. In the research work, its features and methods were studied, the algorithm for solving theory of solving inventive problems was determined, and recommendations for the successful use of this technology in the classroom were highlighted.

After analyzing the theoretical material, a pedagogical experiment was conducted, which consisted of the following stages: identification, formation and control. 22 students of the 3rd "A" grade (experimental group) and 22 students of the 3rd grade "B" (control group) of school budget educational institution No. 93 of Namangan region, New Namangan district took part in the research. In the detection phase, five diagnostic methods were used to determine the level of logical thinking of elementary school students. After analyzing the obtained data, it was concluded that the indicators in class 3A are slightly lower than in class 3B.

Therefore, 3 "A" classes were selected as an experimental group in the research work. At the formative stage of the experiment, 10 Russian language lessons were developed and conducted

using the theory of solving inventive problems technology aimed at developing the logical thinking of elementary school students. Various methods of theory of solving inventive problems technology were used during the implementation of the developed set of lessons. All methods used are aimed at developing logical thinking operations: analysis, synthesis, generalization, comparison, classification.

The final stage of the experiment was a control section to determine the level of development of the logical thinking of elementary school students after conducting a set of lessons designed for the Russian language. The results of the experimental group obtained in the control phase exceed the results of the control group. These data confirm that the implemented set of lessons helps to successfully develop students' logical thinking. Thus, the results of the conducted pedagogical experiment confirmed the hypothesis that the systematic and purposeful use of lessons aimed at developing the logical thinking of junior high school students helps to successfully develop the logical thinking of junior high school students; Application of theory of solving inventive problems technology in lessons and taking into account the age and psychological characteristics of students.

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