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ANALYSIS OF CLASSIFICATIONS OF LOGICAL PROBLEMS AND SYSTEMATIZATION OF EXISTING CLASSIFICATION HEADINGS

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Abstract:
In this article, essence of concept «Logical task» and its role opens up in realization teaching, developing teaching functions. And development of logical thought. Analysed and systematized existent classifications of logical tasks and classification headings. What classification headings are exposed meet most often in the analysed classifications of logical tasks. And what classifications of logical tasks contains most of the classification headings and is most complete. Maintenance of logical tasks is analyzed in school textbooks on mathematics of authors of M. I. Moro and L. G. Peterson. The examples of logical tasks which can be offered to the junior schoolboys on the lessons of mathematics are resulted.

Keywords: Keywords: logical task; classification of logical tasks; classification headings; with a plot logical tasks; logical tasks on the methodical receptions of decision; logical tasks on the logical receptions of decision.

Introduction. In primary school age, learning activity becomes the leading one. Thinking becomes the dominant function at this age. There is a transition from visual-figurative to verbal-logical thinking. School education is structured in such a way that verbal-logical thinking is predominantly developed. This corresponds to the age trends in the development of children's thinking. The development of logical thinking should be carried out in a timely manner at the age of 5 to 11 years. In this regard, in all school programs in mathematics, one of the goals of teaching the subject is the development of logical thinking. Therefore, problem solving occupies a central place in the process of teaching mathematics, since this skill provides the possibility of applying mathematical knowledge in practical activities. Solving logic problems in elementary grades is a propaedeutic for teaching students how to prove theorems.

Relevance: Analysis of the classifications of logical problems, and the systematization of existing classification headings allows us to consider logical problems from different angles, clarify and improve the methodology for working with students on logical problems.

Purpose: to analyze the classification of logical problems, and to systematize the existing classification headings.

Tasks: 1. Analyze the existing classifications of logical tasks. 2. To identify which classification headings are found most often in the analyzed classifications of logical problems. 3. Identify which logical classification is the most complete. 4. To analyze the content of logical problems in school textbooks in mathematics (grades 1–4) by M. I. Moro (S. I. Volkova, S. V. Stepanova), T. E. Demidova (T. E. Demidova, S. A. Kozlova, A. P. Tonkikh) and L. G. Peterson [1].

Presentation of the main material: Nowadays, the teacher not only equips students with solid knowledge, but also teaches them to learn on their own. The ability to solve logical problems does not come by itself; for this, the student must be able to: argue conclusively, think consistently, build hypotheses, refute incorrect conclusions. It is necessary to start teaching students how to solve logical problems from elementary school. Since the solution of logical problems on the way from ignorance to knowledge, from inability to ability, contributes to the successful assimilation of the curriculum, the development of diligence, the desire and ability to study well. The task awakens the student's thought, activates his mental activity. Logic problem solving can only be learned by constant practice. Solving problems with justice is considered the gymnastics of the mind [2].

In order to reveal the essence of the concept of “logical task”, we will quote the definition formulated by N. D. Shatova: logical tasks are tasks with an unusual text structure, a question statement, a more complex relationship between data and those sought. Requiring the manifestation of resourcefulness, ingenuity, originality of thinking. Causing involuntary interest in the student due to the unusual plot, method of solution or illustrative material. Where the main activities are to identify relationships between the objects of the task, and not to find the quantitative characteristics of the object [3].

In the process of primary teaching of mathematics to students, it is necessary to use a system of tasks of logical content. The solution of which requires the construction of a chain of precise logical reasoning with correct intermediate and final conclusions. The proposed logical tasks should help the student to take a different look at the condition of the problem. Evaluated it and tried to solve it in different ways. At the same time, the success of solving such problems should not depend strictly on the level of schoolchildren's education, on their mastery of the program material.

An analysis of various classifications of logical problems has shown that the basis of this or that classification is the essential relations of objects, on the basis of which problems of a certain type are built and solved. Therefore, it can be assumed that the student's knowledge of the type of problem being solved can serve as an indicator that he comprehends his actions, understands their legitimacy. That is, in order to teach

students various methods for solving logical problems, it is necessary to systematize existing classifications in such a way that it unites groups of problems that have different methods of solving [3].

During the analysis of the literature [1-13], it was revealed that there are various classifications of logical problems. In order to systematize the existing classifications of logical problems, it is necessary to analyze what classification headings they contain. As a result of the analysis, we can say that the existing logical classifications contain 31 classification headings. Let's break down these classification headings on the following grounds:

A) Plot logical tasks: 1) Tasks with relationships:

1.1) problems with transitive relations, 1.2) problems with incorrect conditions, 1.3) problems with non-transitive relations, 1.4) problems with several relations, 1.5) problems with equality relation, 1.6) problems for comparing elements in relations; 2) Crossing tasks; 3) Tasks for transfusion; 4) Problems about caps; 5) Tasks for movement; 6) Problems about liars; 7) Tasks for the selection of weights to obtain the desired weight; 8) Tournament tasks; 9) Tasks - jokes and comic stories; 10) Problems with matches; 11) Entertaining tasks: puzzles, dominoes, checkers, combinatorial problems with magic squares, labyrinths, circular counting, games of the sages, geometric problems, sophisms and paradoxes.

B) Logical tasks on methodological methods of solution: 1) Tasks that impose one quite definite answer; 2) Tasks, the conditions of which push the solver to perform some action, while performing this action is not required at all; 3) Tasks in which it is necessary to perform some arithmetic operation with given values; 4) Problems, the conditions of which allow the possibility of "refuting" a semantically correct solution; 5) Problems solved from the end; division; 8) Tasks for establishing the truth of statements; 9) Tasks for guessing numbers; 10) Problems solved using tables and diagrams; 11) Problems solved using graphs; 12) Problems solved by the Eller circle method; 13) Tasks for enumeration of possible options; 14) Tasks for ordering sets.

C) Logical tasks according to logical methods: 1) Tasks to overcome the rigidity of thinking; 2) Tasks, the solution of which is based on reasoning; 3) Tasks for analysis, synthesis; 4) Tasks for eliminating the superfluous; 5) Tasks for analogy; 6) Tasks for classification on a certain basis [4].

Analyzing the identified classifications of logical problems, it can be noted that the largest number of classification 16 headings is allocated by O. B. Bogomolova.

Average indicators of the level of content of classification headings in the classifications of logical problems (5 - 10) from the following authors: L. I. Teplov; E. Yu. Levina; F. M. Myazitova; L. V. Zankov; G. B. Polyak; L. M. Likhtarnikov; E. Ya.

Ignatieva; Basche de Mezirac; Yu. V. Nesterenko, I. F. Sharygin, A. V. Shevkin; L. V. Selkina; N. D. Shatova.

The smallest number of headings is contained in the classifications of logical problems proposed by the following authors: B. A. Kordemsky; F. F. Nagibin and E. S. Kanin; N. B. Babkina [5].

Most often in the classifications of logical tasks the following types of tasks are found: a) According to the semantic content; b) By methodological methods of decision; c) By logical decision methods.

Not all authors mention entertaining tasks in their classifications. It is extremely rare for authors to mention the following classification headings in their classifications: problems with relationships; tasks to establish the truth of statements; tasks that impose one well-defined answer; tasks, the conditions of which push the decider to perform some action, while performing this action is not required at all; tasks, the conditions of which allow the possibility of "refuting" a semantically correct solution; tasks to overcome the rigidity of thinking [6]

After analyzing the proposed classifications, it was concluded that the classification of logical problems by O. B. Bogomolova is the most complete.

a) According to the semantic content: 1) problems with relations: 1.1) problems with transitive relations, 1.2) problems with incorrect conditions, 1.3) problems with non-transitive relations, 1.4) problems with several relations, 1.5) problems with an equality relation, 1.6) problems to compare elements in relationships; 2) crossing tasks; 3) entertaining tasks.

b) According to the methodological methods of solving: 1) tasks using tables and diagrams, 2) tasks solved using graphs, 3) tasks for enumeration of possible options.

c) According to logical methods of solution: 1) tasks for analysis, synthesis, 2) tasks for analogy, 3) tasks for classification [7].

The proposed system of tasks by O. B. Bogomolova contributes to the development of logical thinking, teaches how to correctly build reasoning, put forward and investigate hypotheses, make decisions independently, and activates the mental activity of schoolchildren.

Other considered classifications of logical problems have the following drawback: the content of some classification rubrics overlaps each other, and the combination of different classification rubrics does not constitute the entire set of logical tasks [8].

Since the classification of logical problems by O. B. Bogomolova is the most complete, therefore, it is the basis for the analysis of the content of textbooks for the initial course of mathematics, authors M. I. Moro (S. I. Volkova, S. V. Stepanova), T. E. Demidov (T. E. Demidova, S. A. Kozlova, A. P. Tonkikh) and L. G. Peterson.

O. B. Bogomolova, classifying logical problems according to the semantic content and methodological methods of solution, singled out into 6 sections:

1. Tasks with relationships;
2. Tasks using diagrams and tables.
3. Tasks for the crossing.
4. Problems solved with the help of graphs.
5. Tasks for sorting out possible options.
6. Entertaining tasks [9].

After analyzing the content of logical problems, in the textbooks of the initial course of mathematics in the above sections, we can say that the textbook on mathematics L. G. Peterson is focused on the personal development of younger students, therefore, mathematical knowledge is considered not as an end in itself, but as a means of their feelings and emotions, creative abilities and motives of activity. The author's program in mathematics, edited by L. G. Peterson, contains 4836 various mathematical tasks, of which 1204 are logical problems. In the textbooks of the initial course of mathematics by L. G. Peterson, the percentage of logical problems is 24.9%. With the help of explanatory texts and the system of tasks of the textbook, students form the following operations of logical thinking: synthesis, analysis and selection of the main thing, comparison, generalization, classification, systematization, definition and explanation of concepts, concretization, proof and refutation, etc [10].

The author's program in mathematics, edited by M.I. Moro, contains 5180 various mathematical tasks. Of these - 802 logical problems. In the textbooks of the initial course of mathematics by M. I. Moro, the percentage of logical problems is 15.48%. The textbook by M. I. Moro contains a variety of logical tasks that contribute to the development of logical thinking. Often these tasks do not use the full potential of the means for the development of logical thinking. In the textbook by M. I. Moro, models in the form of a brief note and a drawing of the problem prevail, there are fewer models in the form of a drawing and, accordingly, there are few tasks for their comparison. In this textbook, of course, there are a variety of tasks that contribute to the development of operations of logical thinking [11].

The author's program in mathematics edited by T. E. Demidova contains 3909 mathematical tasks. Of these - 528 logical problems. In the textbooks of the initial course of mathematics by T. E. Demidova, the percentage of logical problems is 13.51%. If we compare the author's program in mathematics edited by T. E. Demidova with the author's programs in mathematics edited by M. I. Moro and L. G. Peterson, then we can say that this program contains the least number of tasks (including logical tasks). This textbook contains a variety of mathematical tasks that contribute to the

development of both mathematical and logical thinking. But it is oriented to a greater extent (in comparison with other analyzed author's programs) to the development of mathematical thinking. As a result of the analysis of the author's program by T. E. Demidova, we can say that this course has intersubject connections with such subjects as: history, history of mathematics, geography, chemistry, biology. In the process of studying this course, students are offered to complete various mathematical and historical projects.

The textbook by M. I. Moro contains more tasks. However, the number of logical problems in the textbook by L. G. Peterson exceeds the number of logical problems in the textbook by M. I. Moro and T. E. Demidova. In the textbooks of M. I. Moreau contains relatively more problems with relations than in the textbooks of L. G. Peterson and T. E. Demidova. Problems for comparing elements in relations, problems solved with the help of graphs and problems with non-transitive relations are only in the textbook by T. E. Demidova. There are no problems with the relation of equality in the analyzed textbooks. Problems solved with the help of graphs are present only in the textbooks of M. I. Moro. Problems with incorrect conditions and problems on the crossing are only in the textbooks of L. G. Petersoni T. E. Demidova. The textbooks of L. G. Peterson contain more tasks using tables and diagrams, tasks for enumeration of possible options, entertaining tasks than in the textbooks of M. I. Moro and T. E. Demidova[12].

As a result of the analysis of mathematics textbooks for elementary school, we can conclude that the author's program in mathematics edited by L. G. Peterson contains more tasks aimed at developing the logical thinking of younger students than the author's programs in mathematics edited by M. I. Moreau and T. E. Demidova.

Since in the textbooks of the initial course of mathematics of the authors M. I. Moro, T. E. Demidova and L. G. Peterson, the tasks are: to compare elements in relations; with the relation of equality; solved using graphs; with incorrect conditions; with non-transitive relations; to the crossing; using tables and diagrams, be contained in a small amount. Therefore, I recommend in mathematics lessons, as an intellectual warm-up, to offer students logical tasks from educational literature: O. B. "Logical tasks for schoolchildren", L. F. Tikhomirova "Exercises for every day: logic for younger students", D. V Klemenchenko "Problems in Mathematics for the Curious", F. F. Nagibin "Mathematical Box" and. Etc [13].

Conclusions: For the initial course of mathematics, a system of problems of logical content is needed, the solution of which is based not on calculations, but on reasoning, requires the construction of a chain of exact logical reasoning with correct intermediate and final conclusions; there should be many tasks with an

unconventional formulation of the question, the answer to which requires careful analysis and understanding of the conditions of the proposed tasks.

Solving logical problems in mathematics lessons will relieve the accumulated tension, intensify mental activity and will contribute to the formation of students' ability to reason, draw conclusions from the conditions and the results obtained. That is, the solution of logical problems, in the process of teaching mathematics, will contribute to the development of logical thinking of younger students.

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