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THE ROLE OF NON-STANDARD TASKS IN THE TEACHING MATHEMATICS OF PRIMARY SCHOOL

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Abstract
Non-standard tasks are those for which there are no general rules and regulations in the course of mathematics, defining the exact program of their solution. Often, they are mixed up in methodology with problems of increased complexity. Tasks of increased complexity contain a condition, which helps students to identify the mathematical apparatus necessary to solve the problem in the elementary school. The teacher can, controls the process of consolidation of knowledge provided by the curriculum solution of problems of increased complexity. The solution of a non-standard problem requires students to conduct research.

Keywords—individual, material, non-standard, solution, task.

I. INTRODUCTION
At the same time, if the solution of the same mathematics problem for one student is non-standard because he is unfamiliar with the method of its solution, for another student - the solution of the same problem occurs in a standard way, as he already knows how to solve such problems. The same mathematics problem in elementary school may be non-standard, but in basic school it is already standard, that is not of increased complexity. Thus, if the student when solving problems does not know the way of solution and does not rely on theoretical material, in this case the problem can be called non-standard at this period of study. What can make a primary class pupil think, begin to think about a mathematical task, a question, a problem, when these tasks are not obligatory for him? Not through coercion, anyway? Nor can verbal requests and persuasions always stimulate a student's thinking.

The main source of inducement of the younger schoolchildren to mental work can be interest. To attract the attention of children, to arouse their surprise - this is only the beginning of the interest, and it is relatively easy to achieve. It is more difficult to keep the interest in math and make it sufficiently stable.

By maintaining interest through different tasks, different ways, methods of solving these tasks, one can gradually develop an interest in the activity itself, an interest in mathematics as a science, which grows into an interest in the process of thinking activity itself, in new knowledge. This is true not only in mathematics, but also for other areas of learning.

The material presented by the teacher and the individual students must be understood by each student, otherwise it will not evoke a desire to work, because it will be meaningless to him. In order to maintain interest in anything new, there must be certain elements of the old, known to the children. Only if the connection of the new with the old is possible to show ingenuity and guesswork.

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II. METHODS

Entertaining material is diverse, but it has the following in common:

-The way of the solution of entertaining tasks is unknown. For their decision is characteristic application of method of trial and error. These search trials may end with a hunch, which is finding a way to the desired solution;

-Engaging tasks contribute to maintaining interest in the subject and play the role of a motivator for students' activities. The uniqueness of the plot and the way of presenting the task find an emotional response in children and put them in the conditions of the necessity of solving it;

-Entertaining tasks are composed on the basis of knowledge of the laws of thinking.

Systematic use of tasks of this type contributes to the development of the specified, thinking operations and formation of mathematical notions of children.

Thus, for the solution of fun problems is characterized by the process of exploratory trials. The emergence of guessing testifies to the development of such qualities in children as wit and ingenuity. Savvy is a special type of manifestation of creativity. It is formed as a result of analysis, comparisons, generalizations, establishing connections, analogies, conclusions, inferences. On the manifestation of ingenuity demonstrates the ability to think through a particular situation, establish relationships, on the basis of which the problem solver comes to conclusions and generalizations. Acumen is an indicator of the ability to operate with knowledge. This implies that wit, ingenuity, entailing a guess as a result of finding a solution to an engaging task, is not something given from above. These qualities of mental activity can and should be developed in the learning process.

- In any case, a guess as a way of solving a problem is preceded by a thorough analysis: distinguishing essential features in the problem, establishing connections between initial data, establishing initial properties, attempts to rely on previously solved problems, etc.
- However, the trial and error method are irrational and unreliable. It is much more important to teach children those methods of mental activity which are more necessary for problem solving - analysis and synthesis, comparison, analogy, classification.
- Offering pupils amusing tasks, we form their ability to perform these operations and at the same time develop them. The criterion for the selection of such tasks is their teaching purpose and correspondence to the topic of the lesson or series of lessons. Such tasks can be solved both when explaining new material and when consolidating learned material.
- The following goals are pursued while solving fun tasks:
- - formation and development of thought operations: analysis and synthesis;
- - comparison, analogy, generalization, etc;
- - development and training of thinking in general and creative thinking in particular;
- - to maintain an interest in the subject and in learning activities (the uniqueness of an entertaining task serves as a motive for learning activities);
- - development of qualities of a creative person, such as cognitive activity, diligence, persistence in achieving the goal, independence;
- - preparation of students for creative activity (creative assimilation of knowledge, ways of action, the ability to transfer knowledge and ways of action in unfamiliar situations and to see new functions of the object).
- Consistent implementation of an organic connection between daily educational work and extracurricular activities allows you to achieve certain successes. It is possible to detect this when

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students solve the tasks offered to them new, previously unprecedented, in a completely original way, not similar to those considered before. There are cases when students find a way of solving that the teacher did not foresee. The goal that every educator should strive for is to teach learning so that the student will eventually surpass the teacher.

- In extracurricular elective classes, students also receive homework assignments that parents can participate in. In addition, each of the students can be in the role of a teacher both at home and at school. Interesting problems, the solution of which is solved jointly by the teacher and the students, are offered by the latter to the parents. This is an important educational moment - to show the child that he or she can know more and better if he or she sets himself or herself this goal.

Solution methods (techniques).

Methods (techniques) of work on a task:
1. Studying the condition of the problem;
2. Coming up with an idea (plan) for a solution;
3. Searching for analogies, comparative drawings.
4. Dividing the task into subtasks.
5. Solving one problem in several ways;
6. Examining a ready-made solution;

There is only one method: the method of giving directions and independently finding a "mouse" in a pile of stones.

"When helping a pupil, the teacher should give him internal help, i.e., limit himself to such hints that could be born in the pupil's own mind, and avoid external help, i.e., give pieces of the solution that are not connected with the pupil's mind"[1].

It is impossible to say how the solution to a difficult problem arises. But it is clear that unconscious processes in the brain play an important role in the solution. Here I will talk about practicing only elementary methods of thinking, using the three precepts of the teacher (according to Poya):

1. Try to teach your students to guess;
2. Try to teach your students how to prove;
3. Use leading directions, but don't try to force your opinion.

When teaching math inexperienced students, who are used to solving problems only on certain rules, everything is difficult.

- Students don't understand what "reasoning" is, why anything needs to be proved at all (the deductive aspect of thinking);
- do not see logical problems (the formal-logical aspect);
- not that they cannot find an approach to a solution, but simply do not understand what it is - "the idea of a solution" (the inductive aspect);
- they (students) are not used to considering connections between tasks (associative aspect of thinking).

In order to train elementary thinking skills, it seems natural to single out the types of such tasks, in solving which the above aspects are applied, so to speak, in their pure form.

I will begin with problems serving to form the deductive aspect of thinking.

The first type includes tasks with "natural reasoning." Their pedagogical role consists in accustoming students to forming a consecutive chain of reasoning (which is the solution to any mathematical

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problem). At first, you should select problems that do not have any unusual mathematical ideas, such as the simplest logical and combinatorial problems and mathematical puzzles.[2]

Two concrete examples:

- An islander has knights who always tell the truth and merchants who always lie. An islander, in the presence of another islander, says that at least one of them is a liar. Who are they?
- Elbek and Malika drew with a pencil. Malika and Laziza drew in the same color. Who drew what?

The second type is "trap problems," in which the answer is wrong. Their role is to show the necessity of proof (reasoning).

- 100 kg of freshly picked mushrooms had a moisture content of 99%. After 2 days their moisture content was 98%. How much did the mushrooms begin to weigh?
- Two boys played checkers for two hours. How long did each of them play?
- The weight of a rooster on two legs is 4 kg. What would be the mass if the rooster stood on 1 leg.

Type 3. The next step in the development of deductive thinking is related to the formal-logical aspect. It may be emphasized with the help of so-called obvious problems, in which the answer is absolutely obvious (and correct), but at first it is absolutely unclear how to get it.

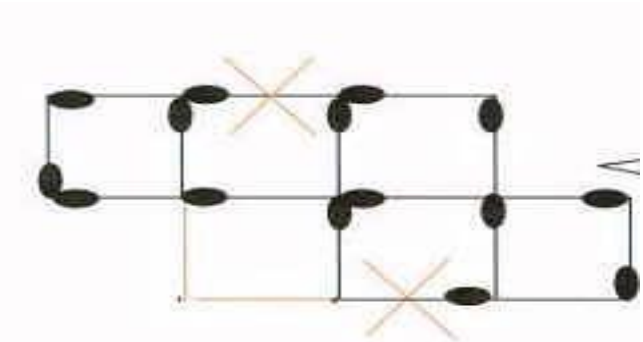
- Mom bought four balloons: red and blue. There are more red balloons than blue. How many balloons of each color did mom buy?

From this point on, we move from formal-logical and deductive problems to inductive ones, which are already directly related to the search for an idea. And our goal is to help children.

One of the oldest and most effective methods of teaching is the "Socratic method," i.e., dialogue with the audience. The art of the mentor is to ask students the kind of questions they should be asking themselves. Of course, such a question may be put to almost any task, but it is desirable that it should not be a direct hint.

So, the fourth type of problem is "problems with an internal question.

a) To put two matches from among the available ones so that a figure consisting of four identical squares is formed.



Let us now turn to the question of the formation of the associative aspect of thinking.

As we know, human intelligence is largely determined by the number of involved connections between the cells of his brain. Naturally, in order to develop mathematical thinking, it is necessary to make connections between facts, concepts, tasks, etc. And the stability of the resulting connection depends on how independently it was discovered. "What you were forced to discover by yourself can be used again when the need arises" [3].

Problem solving often arises by association with something known, I emphasize that not by analogy, but "by association."

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In this connection, I shall present the fifth type of tasks - riddle tasks:

- Count fast: 012345678910.
- How many in the sum of 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 will make up the numbers written in a row?
- How many girls are there in the class?

If you subtract the numbers written with two eights from the largest two-digit number and add the smallest two-digit number to the resulting number, you get just the right number. How many girls were in the class?

Mindfulness and "reading between the lines" is an important part of general education that can be fostered through mathematics instruction. After all, math "puts the mind to work."

Tasks for independent analysis.

1. Find all integer solutions to the equation:

x y = x + y.

2. Daddy bought a watermelon D=20cm, the thickness of the rind was 1cm. What % of the cost of this watermelon was spent on the rind?

3. How many ways can I place 8 rooks on a chessboard without them hitting each other?

4. An express train left Moscow for St. Petersburg and went without stopping at a speed of 60 km/h. Another train came to meet him from St. Petersburg to Moscow and also walked without stopping at a speed of 40 km/h. At what distance will be these trains from each other an hour before they meet?

It is clear from this that non-standard problems are those for which there are no general rules and regulations in the course of mathematics, defining the exact program of their solution. Such problems are usually included in Olympiads.[4]

There are no rules for solving non-standard problems. But great problem-solvers have found a number of general recommendations-guidelines which may be used in solving the problems. These recommendations are called heuristic rules.

To solve a non-standard problem, it is necessary to draw up (find) a plan (course) of solution, which is not necessarily a precise and complete list of actions. Most often it is not even a process, but only an idea, and everything else arises in the process of solution. Sometimes it turns out that the idea is not right, and it is necessary to start all over again. This process cannot be precisely defined, but it is possible to talk about some generally accepted steps, although it is impossible to teach how to find a solution.

Tip 1. Recognize the type of the given problem.

How do you recognize the type of a given problem? The first characteristic is the nature of the requirement of the problem. According to this characteristic let us distinguish 3 kinds of problems:

1. Tasks for finding a searcher (computational tasks).
2. Tasks aimed at proof or explanation (correctness or falseness of a statement, explanation of a factor).
3. Transformation or construction tasks (to construct something, to change it).

Tip 2. Reduce the solution to one that is already solvable.

This advice is simple, but it is not easy to use in practice. After all, there are no specific rules for such a reduction of unfamiliar problems to problems already solved. However, if you carefully, thoughtfully analyze problems, thoughtfully solve each problem, fixing in his memory all the techniques with which

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solutions were found, what methods, ways have been solved problems, then gradually you develop the ability to such a reduction. It is no secret that a person who is not able to solve standard problems, will not solve non-standard ones.

One of the organizers of mathematical Olympiads in Russia, the famous mathematician Vladimir Abramovich Tartakovsky, compared finding a solution to a problem with finding a mouse hiding in a pile of stones. There are two ways to do this:

- Discard gradually one stone at a time until the mouse appears;
- Walk around the mountain and watch carefully to see if the tail shows; then grab and pull the mouse out of the pile.

Indeed, the search for a solution resembles the search for that very mouse. A vivid example of such a search (the problem about the shells found by the boy). Response. There is no boy who has not found a single shell. Since the boys found 5 seashells, there could be such variants of the solution:

1. 2 boys found 1, one found 3.
2. 2 boys found 2, one found 1.
3. One found 4, one found 1, one found none.

Since options 1 and 3 do not correspond to the condition of the problem, the solution is only option 2: 2+2+1.

Finding a solution to a non-standard problem comes down to working on tasks. Procedural, which contribute to the development of skills to compare, analyze, summarize, predict, reason, plan. Tasks on finding and describing the process of achieving a goal under certain conditions are called procedural. The response of tasks is the process of obtaining the factor which is the goal of the activity.

The value of such tasks is that their solution contributes to the operational style of thinking necessary for learning mathematics and computer science.[5]

Procedural tasks can be divided into heuristic and algorithmic (step-by-step) ones according to the type of student activity. This division is purely conceptual. Heuristic procedural tasks involve children in creative exploratory or partially exploratory activities, contributing to the development of intellectual skills.

Ways of solving such tasks:

1. Making tables, (spilling over).
2. Using drawings and reasoning from drawings

Drawing diagrams or block diagrams. (The goat, wolf and cabbage task.)

(Block diagram - weighing coins).

(Drawing for the problem with bicycles).

You can find as many of these kinds of problems as you like or make them up. When solving, students use different symbols, images, and the answers are obtained as a result of reasoning. This is what advances their development.

The third type of tasks: transformation or construction contains the task to recreate the image of the depicted objects and various thought operations with these images. Very common in this type of tasks with matches (examples on sheets).

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CONCLUSION

In conclusion, let us form the main recommendations for finding solutions to non-standard tasks:

1. After reading the problem, one should try to establish what kind of problem it belongs to.
2. If you recognize in it a standard problem of a familiar kind, then apply a general rule to solve it.

If the problem is of a non-standard kind, you should:

a) Extract from the problem or break it down into subproblems of a standard kind (method of splitting), involve analogy;

b) Include auxiliary elements and constructions in the conditions;

c) To replace the task by another equivalent task (the simulation method).

In order to make it easier to understand and solve a task, it is useful to preliminarily construct an auxiliary model of the task - its schematic notation.

Solving non-standard tasks is an art which can be mastered only as a result of deep constant self-analysis of actions for solving tasks and constant training in solving various tasks.

Remember that problem solving is a kind of creative activity, and the search for a solution is a process of invention.

A non-standard task is a task whose solution for a given student is not a known chain of known actions.

The ability to solve non-standard tasks includes moral qualities: persistence, patience, the will to win;

- Knowledge of solution methods; knowledge of heuristic methods and the ability to choose new solution methods;
- Ability to replenish useful information.

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