

**METHODOLOGICAL FOUNDATIONS FOR SHAPING THE
CREATIVE ACTIVITIES OF PRIMARY SCHOOL PUPILS IN
MATHEMATICS LESSONS**

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Abstract. This article discusses the methodological basis for the formation of the creative activity of primary school pupils aimed at forming creative activity by solving tasks related to the search for mathematical laws in the process of teaching mathematics, the tasks to find patterns with geometric content, which is active work on the development of speech, as well as illustrating new concepts.

Keywords: primary school, mathematics, learning process, mathematical laws, task solving, creative activity, education.

Introduction. The primary school teacher's first task is not to miss the sensitive period which is the most favorable for the formation of students' creative activity. Otherwise, what scientists-psychologists have termed as IFOEDA - irreversible fading of opportunities for effective development of abilities will happen. At the same time, the improvement of reproductive thinking also cannot be neglected because it is "an important component of creative activity (especially at the initial and final stages of task solving)". And yet the main value of education nowadays is

the formation of creative personal qualities in a person, needs and opportunities to go beyond the studied, abilities to self-development, continuous self-education.¹

- As a means of solving the task of shaping the creative activity of younger pupils, we have chosen pattern finding tasks. This was done for the following reasons:

- they are a logical continuation of teaching mathematics in kindergartens. The pre-school mathematics program provides for the work on tasks containing questions of the following kind: "What has changed in the second figure (picture) compared to the first one?", "How to continue the started row?", "Which figure out of three is superfluous?", etc;

- do not require a radical restructuring of the current programme;

- have an impact on the development of patterns;

- have a significant impact on the development of analytical and synthetic activity, which is confirmed by statistical processing of experimental training data.²

Until now, pattern finding tasks (whether general patterns or mathematical ones) have not been separately identified in the teaching and learning literature. For this reason, their definition has not been given either. These tasks are presented only as tests in some publications (first of all, by G.J. Eisenk). In our study we focus on the term "task", using a selection of definitions of this term which are presented in the work of G.I. Sarantsev.³

"The most common is the definition of a task as a system (G.A. Ball, Y.M. Kolyagin, L.M. Friedman, A.F. Esaulov). Thus, Yu. M. Kolyagin suggests that by a

¹ Артемов А.К. Задачный подход в подготовке учителя к обучению математике // Начальная школа. – Москва, 2002. – № 2. Б. 114–118.

² Djurayeva D.Sh. Improve the methodological training of future teachers to develop students' creative abilities. //European Journal of Research and Reflection in Educational Sciences. Vol. 8 No. 3, 2020. ISSN 2056-5852

³ Саранцев Г.И. Упражнения в обучении математике. - М.: Просвещение, 1995. - 240 с.

task we understand a particular state of a "man - task situation" system, where the second component of the system is a set of elements interconnected through some properties of relations. If the subject, who has come into contact with a situation, does not know at least one element, property or relation and has the need to establish the unknown elements, properties or relations of this situation, then the latter becomes a task for him. At the same time, the authors delineate in different ways the range of phenomena that belong to the scope of the concept of task. Some use the term "task" to denote objects belonging to the category of goals of actions of the subject, requirements imposed on the subject (A.N. Leontiev), others refer to the category of the situation including, along with the goal, the conditions in which it is to be achieved (L.L. Gurova, Y.M. Kolyagin, Y.N. Kulutkin, A.F. Esaulov, P.M. Erdniev, etc.), others refer to the category of the verbal formulation of this situation (L.M. Friedman). The most common is the use of the term "task" to refer to a situation that includes a goal and the conditions for achieving it.⁴

We will use the latter definition of a task as a situation involving a goal and a condition for its achievement.

So, in our research we understand as tasks in search of regularities such tasks whose solution is logically determined by the regularity of changing features.

Regularity seeking tasks in mathematics include both arithmetic and geometric tasks.

The analysis of many works which at least mention regularity search tasks (although they are not named as such), allowed us to typify these tasks for younger pupils. Typification was made on the basis of the mutual arrangement of objects in the task condition (Scheme 1).

Scheme 1.

⁴ Колягин Ю.М. Задачи в обучении математике. Часть 2. - М.: Просвещение, 1977. - 144 с.



As we see, all tasks in search of regularities are divided into two large groups - tasks with linear construction and with tabular construction. In the case where the elements of the task are arranged in one or more unconnected lines, we will talk about tasks with linear construction; when the elements of the task are arranged in the form of a table, we will talk about tasks with tabular construction.

But before describing specific tasks for searching for regularities, it is necessary to mention a training task. According to A.N. Leontiev, we will understand a learning task as a goal set in certain conditions, which can be achieved by implementing certain actions on the part of the learner and the instructor. The learning task is the main component of learning activity. On the one hand, it clarifies general learning objectives, specifies cognitive motives, and on the other hand, helps to make the process of activity itself meaningful. In the process of solving learning tasks, changes in cognitive processes and personal qualities of a pupil take place.

There are different types of learning tasks: private, local, general, prospective. All types of learning tasks are interconnected in the learning process: solving local and private tasks is usually accompanied by solving general and prospective ones.

In our study the following learning tasks are set for primary school pupils. Perspective learning task - to develop analysis, synthesis, generalization, comparison, abstraction, concretization. The general learning task is related to each individual type of pattern finding task, etc. Here are examples of tasks with geometric content belonging to each of the typing groups.⁵

To solve this type of task, the following scheme is proposed, which the students should follow:

1. Compare the figures of the condition (find the commonalities and differences in them).
2. Formulate the common feature(s) that unite the figures of the condition.
3. Find a figure from the set of answers that corresponds to the formulated feature(s).

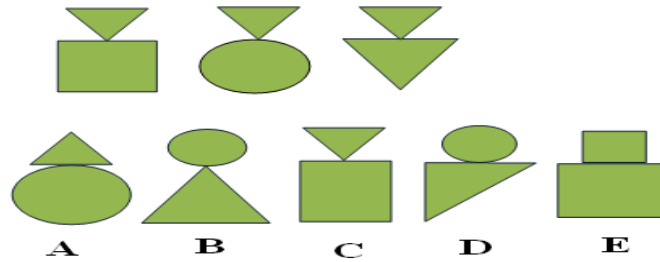
The peculiarity of this kind of tasks is that for them the row with a choice of answers is obligatory. Otherwise, it is impossible to solve the task.

All other groups of tasks may be with or without a choice of answers. In both cases the tasks are solvable. That is, the pictures that are offered as suggested answers are used only to confirm the answer found on the basis of analysis of the figures. Therefore, they should not be shown to children while searching for a solution to the task. Otherwise, the attention is focused not on the solution of the task, but on the choice of the figure they like. Sometimes the child's eyes get lost and he/she "chooses" at random.

While solving geometry tasks, speech development is actively pursued and new concepts are vividly illustrated.

For example: Task 1

⁵ Djurakulova A.X. The role of non-standard tasks in the teaching mathematics of Primary school Proceedings of 2nd INTERNATIONAL RESEARCH e-CONFERENCE on "Corporate Social Responsibility & Sustainable Development" Organized by Dr. D. Y. PATIL VIDYAPEETH PUNE (Deemed to be University) GLOBAL BUSINESS SCHOOL & RESEARCH CENTRE, Pune- 411 033 ISBN: "978-93-87901-17-9" 10th, 11th, 12th December, 2020



Teacher: Look carefully at the figures in the first row. What do they have in common? Which figure could continue the row?

Pupils: The figure under the letter C. It has a triangle.

Teacher: The shape under B also has a triangle.

Pupils: The triangle must be on top.

Teacher: Under A, the triangle is on top.

Pupils: But the triangle is turned like this (represents an inverted triangle).

Teacher: That is, the top figure is a triangle with its base upwards.

All sequence tasks may have finite and infinite sequences. A finite series can be continued by one or more figures, an infinite series lasts as long as necessary.

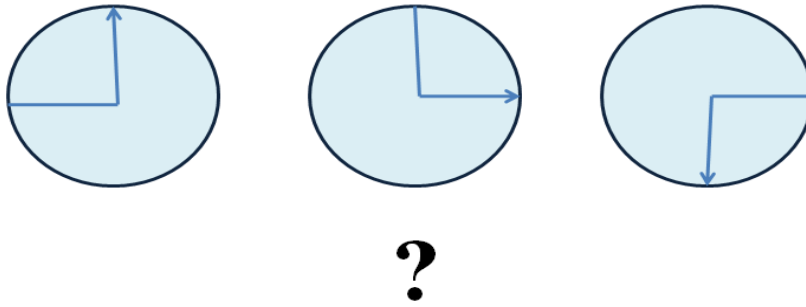
The following is an example of a finite-order sequence identification task:

Task No. 2. Since in each subsequent figure one of the interior triangles is replaced by a circle, the next (and last) figure is the figure consisting of four concentric circles. All triangles have been replaced by circles - so the row is complete.



Task 3.

The second-grade pupils find a very interesting way out of a predicament by solving the task: - Continue the row



Teacher: How do the figures change one by one?

Pupils: The arrows turn.

Teacher: How do they turn?

Pupils: Like this (show hands).

Teacher: Clockwise or counterclockwise? Look carefully.

Pupils: Clockwise.

Teacher: How far does it go?

Pupils: Three hours.

The solution is correct. And so on.

Regularity search tasks are solved both during oral work and are offered for independent solving as a reinforcement of new material and as a test of what has been learned.

When comparing the instructions for solving the different types of tasks, you can see that they are similar in general terms. However, each of them has its own specifics. For example, when solving tasks on finding common features, comparing figures in order to find similar and different features, one should focus on common features, which are the basis for all tasks of the group. Meantime in solution of transformation tasks first of all attention is paid to distinctions of figures, which is basic for this group of tasks. And so on.

We have considered examples making up the group of tasks with linear construction. Let us now proceed to the tabular construction.

As mentioned above, we call tabular construction tasks those tasks whose conditions are arranged in the form of a table.

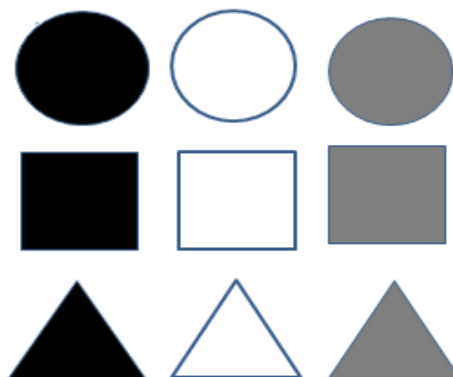
Comparing instructions attached to solving tasks of different types, it is clear that they are similar in general terms. But each of them has its own peculiarities. For example, when solving tasks on finding common features, comparing figures in order to find similar and different features, one should focus on common features, which are the basis for all tasks of the group. Meantime in solution of transformation tasks first of all attention is paid to distinctions of figures, which is basic for this group of tasks. And so on.

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Let us consider, by way of example, what are the tasks with "grid" filling of a table.⁶










Task № 3.



The proposed task identifies two features by which changes occur: shape changes vertically, colour changes horizontally. Horizontally the shape remains unchanged, the colour does not change vertically. Consequently, the condition of a

⁶ Джуракулова А.Х. Творческая деятельность учащихся начальных классов как основа развития математических способностей студентов Республики Узбекистан // Мир образования – образование в мире. – Москва. 2010. – № 4. – С. 76–80.

"grid" table can be represented as a real (conventional) table, titled columns and rows:

Цвет \ Форма	Черный	Белый	Серый
Круг			
Квадрат			
Треугольник			

The solution of the task comes down to "seeing" this table and filling in the empty cell according to the names of rows and columns.

It is recommended to solve "grid" tasks using the following plan:

1. Compare the figures in the columns (find common and different in them).
2. Compare the figures in the rows (find the commonalities and differences in them).
3. Formulate the feature by which the figures in the columns change.
4. Formulate the feature by which the figures in the rows change.
5. Fill in the empty cells in the table according to the formulated characteristics of the figures.

As for the linear construction tasks, for the tabular construction tasks (and for the "grid" ones as well) you may be offered variants of answers.

Each time an answer is given (right or wrong), the teacher should ask the pupil to argue his/her choice, to prove that he/she is right. Why does he choose this figure and not the other?

In a "grid" task, there may be more than one blank cell (one question mark). The main thing to keep in mind when making such tasks is that one column and one row must be completely filled in each time. The maximum possible number of empty

cells in a nine-cell table is four. However, it is advisable to give tasks with several unknowns to the second grade at the earliest.

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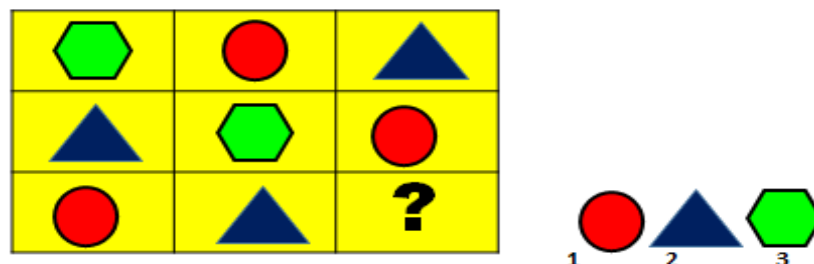
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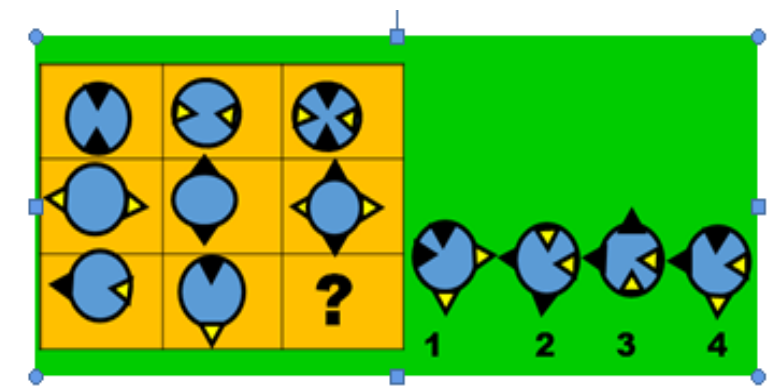
Task № 4.



Of course, this task provides more opportunities to develop thinking than the one where only one figure is unknown.

The last group of all the variety of the pattern finding tasks is the "nested" table. Let us also consider these tasks using an example:

Task No. 5.



Unlike "grid" filling, in this task all features (in our case three - the outer shape, the inner shape and the colour of the inner figure) change both horizontally and vertically. Each figure is, as it were, responsible for itself, forming a single "nest", but is of course in relationship to its neighbours both vertically and horizontally.⁷

The following scheme is proposed to solve this type of task:

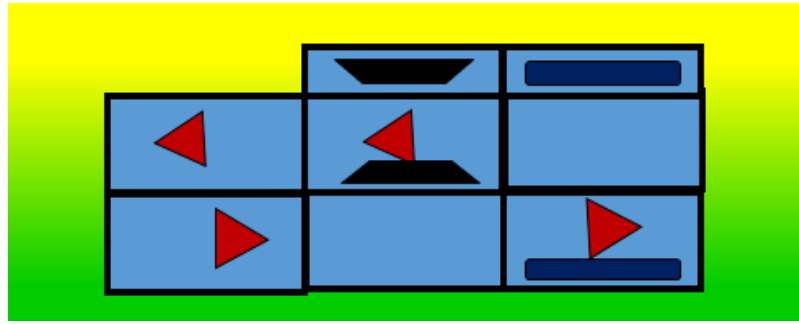
1. Compare the figures in the table (find out what changes in the figures).
2. Formulate the features according to which the figures change.
3. Fill in the empty cells of the table using the formulated features one by one.

Tasks with a "nested" table could also be given as options. We will not dwell on them, since they are identical to the ones given above.

But tasks of this type with several unknowns, unlike those with "grid" filling of the table, have their own peculiarity. It consists in that to completely filled cells on one of the verticals and horizontals at least one more filled cell is necessarily added. Otherwise, it would be almost impossible for primary school pupils to solve the task.

Task No. 6

⁷ Джуракулова А.Х., Бошланғич синф математика дарсларида ностандарт масалаларни мулоҳаза юритиш усули билан ечиш Замоновий таълим. Тошкент 2016, №9, 51-56б



We have considered all types of pattern finding tasks and have grouped them into their respective groups.

However, it is often not possible to link the solution of pattern finding tasks to the topic being studied. This is mainly due to the small amount of geometry material studied at primary school. That is why we offer you pattern finding tasks with geometric content for oral work. This will help to diversify this stage of the lesson, which is full of arithmetic material, and will have an impact on the development of imaginative thinking.

Thus, we propose pattern-seeking tasks as a means of solving the task of forming the creative activity of younger pupils. The definition of these tasks is also given in our research.

The proposed typification of pattern seeking tasks, made on the basis of construction, allows navigating in all variety of these tasks and provides an opportunity to use them in practical activity.

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