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DEVELOPMENT INDICATORS OF SPATIAL IMAGINATION

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ABSTRACT

The main tool for the development of spatial imagination is geometric material. The task of finding ways to acquaint junior schoolchildren with geometric materials that contribute to the development of spatial imagination is urgent. This article analyzes the complex concepts of geometry and recommends classroom activities that develop the spatial imagination of students.

Keywords: spatial representation, geometry, geometric materials, symmetry, spatial forms, point coordinates.

Elementary students need not only to develop spatial thinking skills, but also to acquire existing knowledge, skills, and competencies in geometry. Our goal is to improve the teaching system in primary education, to improve the quality and effectiveness of mathematics education, which is one of the main tasks of educators and professionals. One of the psychological characteristics of children of primary school age is the predominance of spatial imagination, which is manifested in the early stages of learning mathematics. The image is used as the basic operational unit of spatial images of primary school students.

The development of spatial imagination in primary school students is a necessary type of mental activity in which students understand the connections and relationships between objects in the surrounding reality. Imagination in school-age children is mainly the effect of teaching grows again under. A child entering the first grade of school will have a sufficiently developed imagination and he will have a great wealth of different imaginations. As a result of reading in the first grades, he not only relies on perception and memory, but also on the imagination created in his imagination, and mainly masters the material taught clearly [1]. For example, children love to play with clay, that is, to make things out of clay (including plasticize), to make things out of sand, and to draw. These activities, especially drawing, have a great impact on the development of children's imagination[2].

Developing students' ability to visualize and visualize space is one of the tasks that a teacher should pay special attention to, because from a psychological point of view, spatial imagination and imagination are achieved through the creation of projects

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in the field of technology. As you know, drawing is an important tool to make it easier to imagine a mechanism. However, a drawing can be read successfully only if the spatial imagination and imagination increase, and on this basis, the ability to move from a plane image to a spatial image, and vice versa, from a spatial image to a drawing [3].

Geometry is a major part of mathematics. The geometric topics and assignments given in the elementary mathematics textbook are divided into classes according to the age of the students. That is, the geometric shapes learned in Grade 1 are reinforced in Grade 2, and concepts are expanded.

There are some geometric materials in the textbooks that we need to analyze separately, develop a special methodology, use information technology and inform students to master it, to form an understanding, and to increase its effectiveness in education. resources need to be developed[4]. It is necessary to develop a special system of methods to better convey geometric materials to students. This category of geometric materials includes the following.

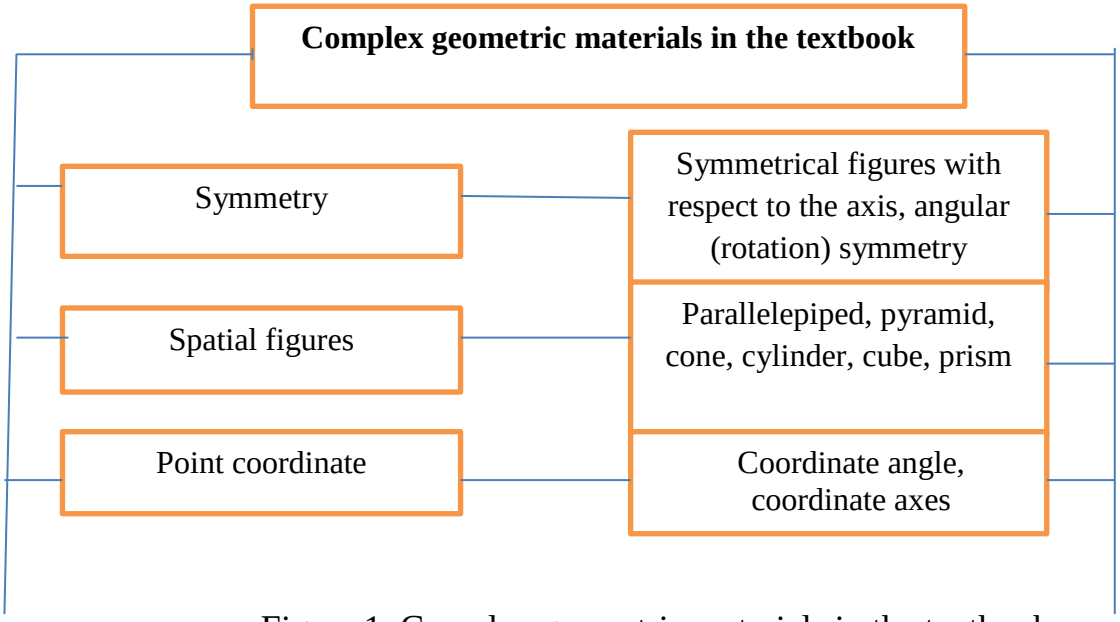

Figure 1. Complex geometric materials in the textbook

Although our students often demonstrate their spatial abilities, it is our teachers who ignore the fact that geometric concepts are formed. Not enough time is allocated to complex geometric concepts (Figure 1), i.e., extra time. As a result, students' geometric spatial imagination is narrow.

Symmetry. The concept of symmetry is first introduced to students from the 1st grade. The symmetrical shape, if we fold it, the two corresponding parts overlap [5]. What is symmetry? -*object, thing, the proportionality of the event, the compatibility* [6]. For example, a mirror, butterfly wings, airplane wings, and so on. The line of symmetry divides the figure into two equal parts. The children have to draw half of the picture, half

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of the person, half of the house, half of the flower. *When a shape is folded, one part of it coincides with the other, so that the shape is symmetrical about the axis. The fold line is the axis of symmetry*[7].

Encourage independent work among 1st graders; give one student a piece of white paper with a line of symmetry and at least 10 colored squares. Suggest placing colored squares to the left of the symmetry line. Tell the second student to place the squares to the right of the symmetrical line (Figure 2). Talk to students about what they have completed.

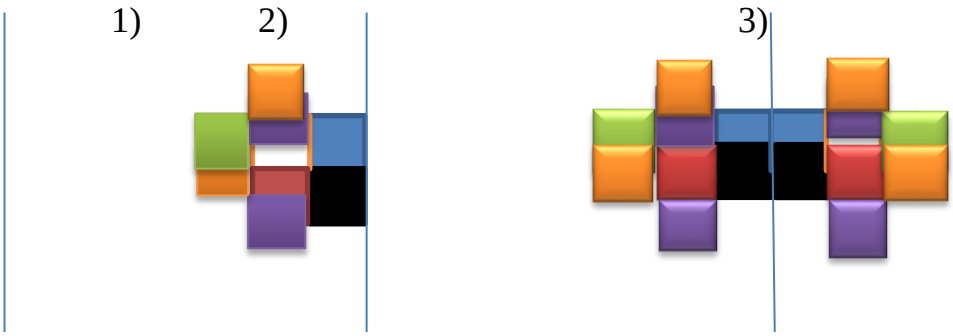

Figure 2. Completed symmetrical shape

Through this activity, students will be able to develop the concepts of symmetry, symmetric axis, and symmetrical shape with respect to an axis. During the lesson, give students examples of objects that can be symmetrical and encourage them to describe the appearance of a geometric shape. Through this activity, you can develop students' spatial imagination.

Spatial figures. In elementary school, we teach geometric shapes in two types, flat and spatial. We first create an image by comparing and contrasting spatial shapes. For example, a ball-ball, a parallelepiped-cupboard, a box, a cone-buratina hat, or a nose, and so on. In Grade 1, students form an image by using simple spatial shapes such as cubes and spheres to distinguish objects from objects. Gradually, students will learn the basics and aspects of spatial figures. For example, a cube-base and all its sides are squares, a parallelepiped-base and its sides are right angles, and a pyramid-base square is a triangle. These concepts help to better understand the properties of spatial figures (edges, ends, surfaces). Students learn to draw, construct, and destroy spatial figures. Let's make a skeleton of spatial figures (we will work with 3rd graders). You can use plasticize and straw sticks or water cans for this. First we use our spatial imagination. All students have white paper and pencils on their desks).

- Write the name of a parallelepiped-like object in your imagination and draw a sketch of any one.

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- Why do you look like a parallelepiped (talk).
- Determine the sides and edges (how many).
- There are several ends of a parallelepiped.
- Determine which geometric shapes are formed by laying the bases in the plane.
- How many edges does a parallelepiped have in your imagination (separate the number of long and short edges).

The parallelepiped has 8 short identical and 4 long edges. We make 8 short and 4 long straws, small circles out of plasticize to connect the straws, and form a parallelepiped skeleton. Show students a parallelepiped skeleton made of a combination of plasticize and straw (Figure 3). Ask students to reinforce.

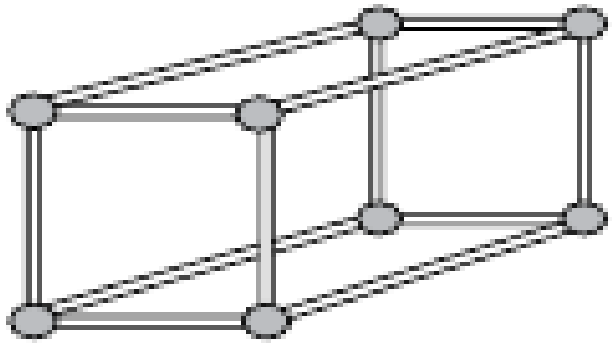

Figure 3. Parallelepiped skeleton

- There are 8 pieces of straw in the group. 4 of them are short and 4 are long, there are 5 connectors (plasticize). What shape is this?
- How are skeletons different from solids?

Have a puzzle game with the students. Invite each student to draw a random space figure. Give them the task of exchanging the drawings with their partners and making a skeleton of the figure depicted.

Effectiveness: Students develop a spatial imagination, learn about the properties of a geometric figure (edge, tip, sides), develop the ability to compare, contrast, compare, develop a sense of creativity.

Modeling is one of the most effective forms of classroom work that develops students' spatial imagination. The didactic advantage of such exercises is that they not only facilitate the formation of an idea of the spatial properties and relationships of the described object, but also help to better understand all the remaining information based on the drawing. The essence of this method is that it forms a mental activity that is specific to the process of imagination. In the process of modeling, practical changes in appearance are the basis for the formation of the necessary mental activity. In the

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process of modeling, the student perceives not only by seeing the image of the body, but also by skin perception, engaging in activities such as logical analysis.

Point coordinate. Elementary students are first introduced to the concepts of the simplest geometric shapes such as point, straight line, light, and section, and then these concepts are used to help them master the topic of the coordinate plane. Students will be able to use the coordinate systems they encounter in everyday life to identify the locations of real objects: theater spectators, airplane passengers, and chess pieces.

By light we mean infinitely continuous lines coming out of a point. When a point A is placed on a straight line, two rays are produced. Light is the part of a straight line that starts at a certain point[8]. The points lying in this light are called point coordinates, and the points are denoted by capital letters. The teacher draws a rectangle on the board, let's see where this geometric shape is on the board (4th grade students' opinion):

-The geometric shape is on the left side of the board.

-Located on the edge of the board.

- Located in a quarter of the board.

- Located in the middle of the board.

In the formation of spatial imagination in students, the location of objects is estimated by the concepts of left, right, back, front, high, low. The ends of a right-angled rectangle are determined by the coordinate angle with respect to the sides of the board (vertical and horizontal). The location of any point is determined by two coordinates: the first coordinate OX on the horizontal axis, the second OY on the vertical axis [8]. For example, the first coordinate of point A is 2, the second coordinate is 2. It is written as follows: Point A (2; 2), point D (7; 2), and point O have coordinates (0; 0) (Figure 4). Find the coordinates of the remaining points.

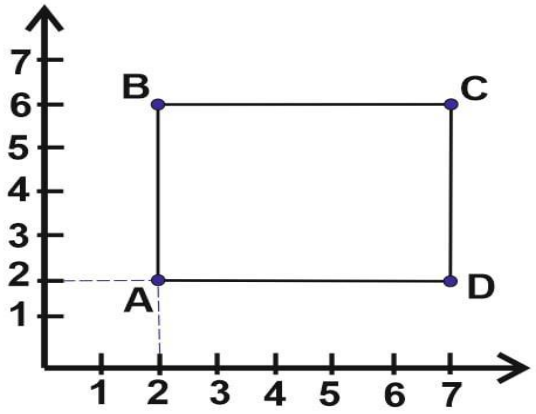

Figure 4. Coordinate angle

Gradually, from about 4 to 9 years of age, the child begins to perceive and demonstrate objects from different perspectives and incorporates ideas of perspective.

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Considering the location of features or objects relative to each other and the vertical and horizontal relationships become part of a child's way of seeing the world [9].

One of the most effective forms of class work, which develops students' spatial imagination, is drawing, modeling. The didactic advantage of such exercises is that they not only facilitate the formation of an idea of the spatial properties and relationships of the described object, but also help to better understand all the remaining information based on the drawing. The essence of this method is that it forms a mental activity that is specific to the process of imagination.

The spatial imagination formed during primary education is the most positive and effective. Therefore, we believe that textbooks should include as many materials and assignments as possible that develop geometric spatial imagination. There are two sides to the teaching process. The teacher teaches, the student reads, the success of teaching is the success of the teacher. The scientific and methodological knowledge of the teacher is important in the development of pupils' thinking skills. In the learning process, we set goals such as focusing pupils' attention, focusing on logical thinking, and shaping their thinking[10].

Not only educators, but also parents are responsible for shaping the next generation not only with a broad vision, but also with intellectual potential, independent thinking, will, and a broad outlook.

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