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# Use of Visualization in the Process of Learning Mathematics in Elementary Grades

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**Abstract:**

In this article we address the issue of the need to use "material" visual aids in mathematics lessons in the era of the dawn of information technology. We also share the experience gained in the process of teaching junior schoolchildren a propaedeutic course in geometry.

**Keywords:** information technology, method, visual aids, perimeter, area.

## INTRODUCTION

Among the many branches of mathematics that are studied at school, geometry occupies a special place. Mastering this academic subject is necessary for a modern schoolchild for various reasons: geometry has the greatest developmental potential; in the process of learning, the student acquires knowledge, skills and abilities that he can apply outside of school; This knowledge is necessary to successfully pass the Unified State Exam. However, in recent years, the level of geometric preparation of students has decreased significantly and reached a minimum level.

## MATERIALS AND METHODS

The propaedeutic course in geometry begins in the first grade. In our case, the study of this section of mathematics takes place within the framework of the educational complex "Prospective Primary School". The content of the entire course can be represented as a holistic development over four years of five main content lines: arithmetic, geometric, magnitude, algorithmic (learning to solve problems) and information (working with data). Algebraic material is considered in arithmetic and algorithmic lines. The geometric line is built as follows.

## RESULTS AND DISCUSSION

In the first grade, the following geometric concepts are studied: a flat geometric figure (circle, triangle, and rectangle), straight and curved lines, point, segment, arc, directed segment (arc), intersecting and non-intersecting lines, broken line, closed and open lines, internal and external areas relative to the border, polygon, symmetrical figures.

In the second grade, the following concepts and their properties are studied: straight line (aspect of infinity), ray, angles and their types, rectangle, square, perimeter of a square and rectangle, circle and circle, center, radius, diameter of a circle (circle), and also questions constructing a circle (circle) using a compass and using a compass to plot a segment equal in length to a given segment.

In the third grade, types of triangles are studied (rectangular, acute and obtuse-angled; scalene and isosceles), an equilateral triangle is considered as a special case of an isosceles, the concept of the height of a triangle is introduced, problems on cutting and composing figures, on constructing symmetrical figures are solved, a cube and its image on plane.

In fourth grade, geometric material is focused mainly around the question of calculating the area of a polygon based on dividing it into triangles. In this regard, the concept of the diagonal of a rectangle is introduced, which makes it possible to divide the rectangle into two equal right triangles, and this, in turn, makes it possible to calculate the area of the right triangle. Dividing an arbitrary triangle into two rectangular ones (using height) is the basis for calculating the area of a triangle.

Of particular importance is the range of knowledge studied in first grade. Understanding and differentiation of such concepts as a flat geometric figure, straight and curved lines, point, segment, arc, etc. Based on this, it is obvious that special attention should be paid to the study of geometric material during this period. The application of the principle of clarity is most effective when studying geometric material. This principle was formulated by Ya.A. Comenius in his "golden rule". It reads: “Everything that is possible to be represented by the senses: what is visible to perception by sight, what is heard by hearing, smells by smell, what is tasted by taste, accessible to touch by touch, must be represented through these organs of perception.”

Fundamentally new opportunities are provided to us in this regard by information technologies, which allow us to visually represent the essential laws and patterns of the cognizable that are hidden from direct perception. Various kinds of electronic visualizers are actively used today in the field of physics and chemistry, but still cannot properly “enter” the classroom and student audience. Despite this, we would like to draw attention to the fact that it is impossible to refuse to use visual aids made by the student or teacher himself. Communication with a computer puts a strain on the visual channel of information perception, but a person also has auditory and kinesthetic (through writing) channels [2].

It is also known that people differ greatly in which sensory channel is dominant: visual, auditory and kinesthetic. It turns out that we give preference to some, discriminating against others. Therefore, it is important that the younger student has the opportunity not only to see visuals from different angles, but also to touch and perform various manipulations (fold, move, cut, etc.). Therefore, we developed and used special visual aids in our work. Let's look at some of them below.

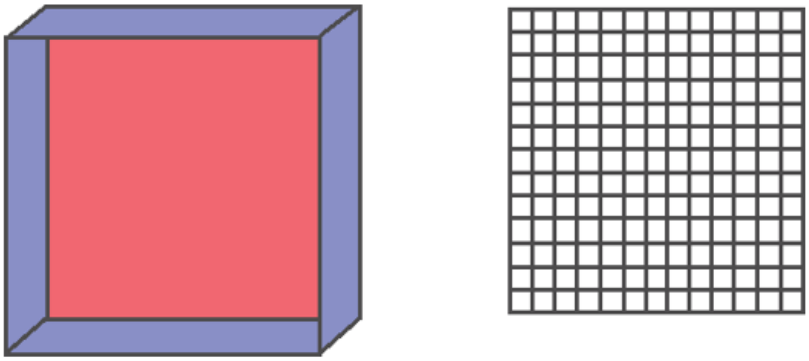

**Fig 1. Visual aid "Vegetable garden".**

As current tests of knowledge show, students in grades I–IV cannot cope with a number of seemingly simple tasks. For example, some students make mistakes when calculating the perimeter and area of a polygon. Often, even in fourth grade, there are students who cannot accurately show the side of a polygon, its vertices, and do not distinguish polygons well. Often they cannot clearly distinguish between the terms "perimeter" and "area" [3].

Therefore, the use of this visual aid is justified. We used it to study the topic: "Closed broken line" and prepare children to perceive in the future the topics "Perimeter of a geometric figure" and "Area of a rectangle."

Also, with the help of this manual, we were able to convey to primary schoolchildren the need to determine the name of a geometric figure, relying not only on external signs, but also using a ruler. The palette, which is placed on the bottom of the box, visually has a square shape, however, when measuring this, it turns out that the width of the palette is 17 cm and the length is 18 cm. Therefore, the palette is rectangular.

The next visual aid is "Broken Line" (Fig. 2). Using it in lessons helped develop the skill of determining the length of a broken line, and in the future, the perimeter of a geometric figure. In addition, clearly show that from the knowledge that two geometric figures have the same perimeter, it does not follow that they have the same area.

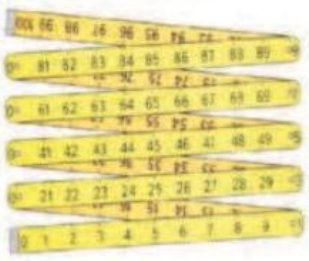

**Fig 2. Visual aid "Broken line".**

When developing a lesson summary, it is important to use tasks not only aimed at formally finding the perimeter, but also of practical significance. For example, "How many meters of plinth do you need to buy if the length of the room is 8 m and the width is 5 m?" [4]

During a mathematics lesson, visual aids can be objects that, at first glance, have nothing to do with a given academic subject. These include yarn or twine threads. They can be used to determine the length of a curved line, circle or perimeter of "specific" shapes (drawing of a lake, snowflakes, etc.). Such work evokes a positive response from students and increases interest in studying geometric material.

## CONCLUSION

We are confident that the use of computer technology can transform the teaching of traditional academic subjects, rationalizing child labor, optimizing the processes of understanding and memorizing educational material, and most importantly, raising interest in learning to a consistently higher level, but only in combination with traditional teaching methods.

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