The Role of the Heuristic Method in the Development of Creative Activity of Students in Teaching Geometry

M. Sobirova, N. Kholmirzaev
Denau Institute of Entrepreneurship and Pedagogy

Annotation:
The paper examines the effectiveness and types of the heuristic method for the development of educational and creative activities of students in teaching geometry.

ARTICLE INFO

Article history:
Received 25 Jan 2022
Revised form 15 Feb 2022
Accepted 8 Mar 2022

Key words: Educational and creative activity, space, heuristic method, problem solving.

Geometry undeservedly considered one of the most difficult school subjects. However, it is during the study of this section of mathematics students from various universal learning activities, which subsequently contribute to the development of intellectual activity of the individual, capable of exploratory and research activities, creative self-realization, development of creative thinking with a standardized program. The higher the level of creative development of the student, the higher the level of his general mental development, the higher his ability to work. That is why one of the tasks that a modern teacher sets for himself is the development of the student’s creative abilities. Targeted development of students’ theoretical thinking combined with the improvement of creative thinking.

Creative thinking is the highest level of personal development. J.P. Guilford believed that the level of creativity (creative thinking) development determined by the dominance of four features in thinking.

The originality of expressed ideas, the desire for intellectual novelty, semantic flexibility, i.e. the ability to see an object from different angles, the ability to discover the possibility of a new use of this object, and, of course, creative thinking is characterized by imaginative adaptive flexibility [1]. Logical tasks are very exciting for children, which along with the tasks of creative nature allow reveal the mental abilities of students, so you can use them at every lesson.

In order to develop logical thinking students need to offer them to make their own analysis, synthesis, and comparison, and classification, generalization, to build inductive and deductive inferences. This opportunity provided in the conditions of performing logic-search tasks [2], which will provide continuity of transition from simple formal-logical actions to complex ones, from tasks for reproduction and memorization – to truly creative ones.

However, of course, the biggest role in the development of creative abilities of students in geometry classes is the solution of problems. It is important to choose for each studied topic a system of problems in such a way that the children have a wide scope for creativity. Currently there is a significantly increased interest of teachers in psychological and pedagogical knowledge. It is now obvious to everyone that improving the skills of the teacher depends largely on how much he uses psychological and pedagogical knowledge, how,
based on them, is able to critically rethink the traditional experience of teaching mathematics, new ideas of didactics, the experience of teachers – innovators.

Under the “method of learning” in didactics, understand ordered ways of interconnected activities of the teacher and students aimed at achieving teaching and educational objectives. There is no point in dividing the methods and techniques of learning into “new” i.e. more progressive, and “old”, traditional, supposedly outdated. The most experienced educators, formed because of long practice of teaching, have developed traditional teaching methods over time. It is our direct responsibility to make the most of this experience.

The heuristic method defined in various ways. Let us take as a basis the interpretation of this method by V.M. Bradis. The heuristic method is a method in which the teacher, instead of presenting educational material in a ready-made form, leads students to “pre-discover” theorems, their proofs, to the independent formulation of definitions, to drawing up tasks. From this definition, it follows that the method of expedient tasks is a kind of heuristic method. Other varieties of this method are also widespread in geometry classes. Therefore, we will divide the heuristic method into the following types:

1) The method of expedient tasks;
2) Heuristic conversation in which students led to a definite conclusion by means of a system of questions;
3) Problem setting and solving (or just solving);
4) Generalization of the method of problem solving and drawing up recommendations for finding solutions to similar problems.

Let us look at a number of examples.

**Example 1.**

While studying the theme “Rhombus” the following task given: “By observation establish the properties of the diagonals of rhombus. Formulate and prove the corresponding theorem”. Pupils led to the independent formulation of this task, for example, by the following questions: “Does the rhombus have the same properties as the parallelogram? Are there any new properties inherent in it?” From the drawing students identify the properties of the diagonals of the rhombus, formulate and try to prove their hypothesis.

**Example 2.**

Instead of explaining the derivation of the formula for the common term of a geometric progression himself, the teacher gives the task immediately after defining the geometric progression: “Try to make up the formula for its common term”. Students can do this task quickly and easily by analogy with an arithmetic progression.

**Example 3.**

While studying the topic about dependence of perpendicularity and parallelism of lines and planes, we are reminded that there are several signs of parallelism of lines and planes (for example, two perpendiculars to one line on the plane are parallel, etc.), but we know only one sign for parallelism of planes. The problem posed: “Can we specify other signs of the parallelism of the planes?”. By examining the models, students independently formulate and sometimes prove the theorem: “If two planes are perpendicular to the same line, then they are parallel”.

**Example 4.**

At a math club class, students explained how to represent irrational numbers on a number line using the method shown in Figure 1: “How can we represent the numbers \(\sqrt{7}, \sqrt{43}\) and so on? After all, it takes a long time to build 6 or 42 triangles. Is there no other way?”. A problem situation arises. The teacher supports it. The problem is formulated: “Find a more rational way to represent irrational numbers \(\sqrt{n}\) on the number line...
Having represented the desired segment in the form $x = \sqrt{n}$, $x^2 = n$, the students guess that any theorem can be used to construct it, expressing the dependence: $x^2 = pq$. The final solution to the problem carried over to the next class. Students look through various textbooks at home and find a number of theorems. Without waiting for the next class, on the second day they are already happy to tell the teacher the number of construction methods they found (Fig. 1).

![Fig. 1](image)

The heuristic method should be used in a reasonable measure, neutralizing its drawbacks with various techniques. Let us consider some of these techniques.

First of all, it is necessary to help those students who do not have time to solve problems in class. First of all, all students should form the skills necessary to solve problems independently:

1) Select and consider particular examples;
2) Use analogy with known facts;
3) Formulate your own proposal;
4) Prove it

With the help of this plan, several problems solved in class. Each student then knows, using the list of directions, what to do and in what sequence to solve the problem, and takes an active part in the work. In the classroom, no consuming problems posed that all students of the class have time to solve with a small difference in time. More time-consuming problems are included in homework. In lessons, only a problem situation created and a problem posed. At home, each student can quietly take his or her time, examine a sufficient number of special cases, refer to books, and come up with a “discovery” on his or her own, feeling great satisfaction, which usually manifests itself the next day in lively discussions.

References