



Formation Of Methodological Components For Solving Non-Standard Problems In Mathematics

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ABSTRACT

Below in this article, an opinion is expressed about the necessary, targeted introduction of methodological innovations aimed at solving non-standard problems on the topic of mathematics "Pythagorean Theorem" among students of general secondary education, special and presidential schools.

Keywords:

innovation, State educational standard, qualification requirements, Pythagorean theorem, non-standard, graduation.

Enter. According to the requirements for the quality and efficiency of educational processes established by the State Standards of General Secondary Education of the Republic of Uzbekistan, as well as the social order of the population organized in educational institutions, today's student:

- remember and re-explain the information received;
- be able to apply acquired knowledge in familiar situations;
- be able to apply acquired knowledge and practiced skills in unfamiliar situations and create new knowledge;
- must carry out learning activities, such as the ability to apply existing knowledge, skills and abilities in daily activities.

Literary analysis. Also, education in our country is aimed at raising a person capable of critical and analytical thinking, conscious perception of the environment, high motivation for independent creative and innovative activities, as well as high potential for self-development. . It follows from this that secondary education in general education institutions is not limited to providing students with knowledge in the form of information and

information, but encourages them to "creative and research education, to search for information, and create knowledge based on it." , and ultimately, a generation that will ask questions must be raised to take advantage of the knowledge gained. In our opinion, there are broader conditions for organizing the educational process that meets these requirements, mainly in academic subjects that require the student to have creative abilities, independent thinking, observation, a broad outlook, imagination and logical thinking. In particular, solving non-standard problems in teaching mathematics in general education, specialized and presidential schools is the most optimal way to achieve the above results. At this point, the question arises: what tasks should be performed in order to develop in students the educational, personal and intellectual qualities necessary to solve non-standard problems in mathematics, or how should the teacher organize the lesson process to complete these tasks?

Research methodology. In our comments, we examined in detail what educational, personal and intellectual characteristics are necessary to solve non-standard problems using the

Pythagorean theorem. In this paragraph we will provide more space for commentary on the work that should be done to develop these qualities (characteristics).

After certain stages of self-development, the student feels that his creative abilities have begun to manifest. Creative abilities are formed as a systematized sum of many skills, abilities and abilities and are manifested in the form of skills with specific symptoms in approaches aimed at a specific life (or educational) situation will. In order not to confuse the phenomenon of creative ability with independent thinking, in the preface of our comments we summarize the definitions of this concept by specialists from different periods, which are close in content and essence to the topic of our research, and provide a description of the creative abilities necessary for solving non-standard problems in mathematics (the topic of the Pythagorean theorem).

Creativity is a form of high manifestation of human activity and independent activity. The scheme of activity typical for creativity is described by experts in the following form: "I search - I take a non-standard (non-traditional) approach to find, I think - I think from all sides - I solve, I develop myself - I change - I change." Based on this, it can be said that the final product of creative activity is a purposeful change of the properties of the studied object. That is: - opening up new aspects of the nature of the phenomenon (object) under study; - creating a basis for the emergence of new opinions and views about the object; - ensuring the change of perceptions about the object as a result of creative activity.

Analysis and results. At this point, we will dwell on the considerations regarding the process of formation of the most important features, which are considered to be a component of creative ability, necessary for solving non-standard problems in mathematics (the topic of the Pythagorean theorem). According to experts, creativity, i.e. creative ability, includes the following features:

- analytical skills (understanding the conditions and requirements of a non-standard issue);

- the ability to generalize (the subject of the Pythagorean theorem of mathematics) to generalize the parts of one's knowledge related to the problem being solved, focusing on one hypothesis or assumption);

- the ability to see the result (getting into the solution of the problem, having the grounds to confirm or deny the assumption or hypothesis). We consider it appropriate to pay special attention to the process of formation of each of the features that are part of creative ability, which is one of the most important qualities necessary for solving non-standard problems.

While learning the skill of analysis, we believe that there must be a certain purposeful sequence of analysis aimed at solving a non-standard problem. In our opinion, the analysis aimed at solving non-standard problems should be carried out in the following sequence:

- analysis of concepts, terms, words included in the issue;

- the analysis of available information on the conditions and requirements of non-standard problems (this analysis can be in the form of students' answers to the teacher's questions or students' own questions);

- analysis of educational materials and additional resources necessary for solving non-standard problems (laws of optics, concepts used within the subject);

- methods of non-standard problem solving. In this sequence, we can note that the analysis of the simplest objects is introduced, and then the objects of analysis gradually become more complex.

According to experts, if the analysis is carried out in the above sequence, the process of formation of analysis skills will be more efficient and its result will be more productive, that is, after the analysis results of one learning object are completed, enter the analysis of the next more complex object. It would not be unreasonable to call this sequence the conventionally obvious "levels of learning to analyze".

Analysis and results. As the formation of the student's ability to analyze is one of the most important conditions for solving non-standard problems, we present our opinions based on

sources about the methods of implementing this process in accordance with the "levels of learning to analyze" that we mentioned above. In order to develop analytical skills, which is considered the most important component of creative ability, which is necessary for solving non-standard problems, it is necessary to create a foundation that ensures the formation of the quality of structural vision. According to him, the student's interest in analytical skills should be started from the very first hours of class:

An educational environment should be created so that the student can understand why the Pythagorean theorem is often repeated in life. For example, conditions should be created for the student to independently perceive that the essence of the concept of a right-angled triangle expands during the transition from topic to topic, and that it is much more complicated than its interpretation in the initial topic studied according to the Pythagorean theorem. It is in such educational conditions and pedagogical environment that at a certain stage of regular and purposeful systematic lessons, the student will have the ability to systematically see the essence of the Pythagorean theorem, the main goals of their introduction to science. The approach based on the ability to see the object of analysis structurally should be strengthened in accordance with the "from lesson to lesson" procedure, and finally this approach ensures that the student's ability to analyze becomes a skill. The analysis includes several psychological actions and actions as the most important component of the creative ability that the student is required to have in order to solve a non-standard problem:

- familiarity with the presented issue (that is, with the object of analysis);
- a detailed study of the individual constituents of the object of analysis;
- to clarify the nature of each element that makes up the object of analysis;
- promote generalization and interpretation (assumption, hypothesis).

As long as we want to talk about the ways in which the student acquires analytical skills in accordance with the "lesson-to-lesson" method

of structural vision, it is necessary to clarify the essence of the concept of "structural vision". This concept embodies the essence of the word "structure", separates the primary elements forming the object of analysis in a separate form, and focuses on studying the essence of each of them. For example, the teacher asks "What do we understand about the angle of refraction of light?", "How does vision happen?", "Why do material objects appear to us in different forms?" It is necessary to raise a question that will be the subject of intense debates, and monitor the participation of each student in these debates, and at the same time coordinate the process. In this process, it is important that the assumptions and hypotheses of each student are reflexively accepted by the teacher.

Summary. In the course of our article, we have sufficiently focused on the reasoning that solving non-standard problems in mathematics (the topic of the Pythagorean theorem) increases students' heuristic ability and learning activity. But one of the main questions in this chapter, that is, whether the practice of solving non-standard problems in mathematics (the topic of the Pythagorean theorem) should be introduced in educational institutions with a heuristic environment and high level of learning activity, or non-standard problems in mathematics (the topic of the Pythagorean theorem) based on sources and the author's personal experiences around the question of whether it is necessary to develop these abilities and qualities in students by introducing solving comments were made. In conclusion, it was concluded that it is recommended to first form learning characteristics, qualities and many abilities necessary for the student to solve non-standard problems in mathematics (the topic of the Pythagorean theorem). That is, it is desirable for the mathematics teacher to "prepare" the student consistently and purposefully based on the order of "lesson to lesson". This is one of the important issues covered in our article.

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