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METHODS USED IN THE PROCESS OF TECHNICAL CREATIVITY

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Annotation: in-class and out-of-class activities of teachers and students, strategies for preparation for creative activities, specific advantages and disadvantages of new methods of solving problem situations.

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Methods of organizing creative activities. People face creative issues at every step, but they don't always try to do them in a creative way. In particular, the problem of organizing creative activities of students in the classroom and extracurricular activities, which are the main forms of organization of education, has not found a complete solution. Although some solutions to this problem have been proposed in the extracurricular activities, the problem of organizing students' creative activities in the classroom has not been sufficiently studied.

In short, creativity can be described as finding a simple solution to a seemingly complex problem. It is often called a rational solution, or invention. This idea can be explained by the example of technical creativity, which has a more material form. In general secondary education, according to the STS and curriculum of physics and labor education, students should theoretically study the concept of deformation, professionalism of materials hardness, mortality, priority, and practice in laboratory-practical classes. However, industrial-type test equipment, such as the R-20, SM-4, designed to perform this laboratory work is so large that it is not possible to install it in all educational institutions prevents the creative organization of work because it does not allow it to be used.

The inventor solves this problem in a simple way by installing a force measuring device that uses the metal cutting shears to cut the sample. The simplicity of this solution is based on many arguments, such as the use of simple scissors as a solution to the problem, the ability of students to prepare the invented device on their own, and the fact that all students can use the device prepared in this way. Most importantly, students will learn that "incomprehensible operations" performed by large and complex devices can be performed intelligibly on simple devices.

So, invention is not a game of demanding, subtlety or "mind game", but a way of development that brings human activity to a new, more comfortable situation for

Him. It is these creative and inventive qualities in man that have overcome the competition with the forces of nature and laid the foundation for the formation of a new ability to think.

In the process of growing human needs, the tools of labor used by him also became more complex and sophisticated. Along with the achievements in its path, human development has also caused many problems. Until recently, these problems were solved by only one method - the method of application and error. Although this method was aimed at finding a single one among thousands of error solutions, it was used to invent electric motors and generators, internal combustion engines, open-hearth furnaces, telephones, and aircraft. However, the extreme complexity of technical and technological processes has led to the improvement of the method of application and error in two directions: first, to

increase the number of ideas proposed as a solution to the problem; the second is to increase the demand for the selection of proposed ideas.

Although initially both directions demonstrated compatibility, later it became clear that subjectivity in the choice of solution options was related to the lack of protection from errors. To prolong the 'lifespan' of this method, a way was chosen to speed up the comparison of options. The first examples of computers worked on this principle. At the same time, it turned out that the problems of creativity can not be solved by comparing a large number of options.

In conclusion, it is impossible to achieve new qualitative changes using the method of action and error, which is currently the main "weapon" of teachers and students. In our opinion, arming teachers and students with a variety of time-tested methods of creative activity is the best way to improve the situation.

As the current stage of human development is associated with the development of modern technologies in all areas, the education of a harmoniously developed generation, which has thoroughly mastered the ways of creativity, is one of the most important tasks of the education system of the republic. The main solution to this problem is to organize the work of general secondary schools in accordance with the purpose.

As the current stage of human development is associated with the development of modern technologies in all areas, the education of a harmoniously developed generation that has thoroughly mastered the ways of creativity is one of the most important tasks of the education system of the republic. The main solution to this problem is to organize the work of general secondary schools in a purposeful way. The strategy of preparing students for creative activities is based on the following main methods:

- Always draw students' attention to the universality of the method used to solve the problem. As a result, students become accustomed to looking for new laws and solutions by applying the method used in the lesson to a particular situation;

Teaching students creative methods is not seen as a goal of the lesson, but as a new way, an opportunity to more effectively solve the task set in the lesson. Tasks aimed at finding a solution to the problem involve analyzing the structure of the system under study and the processes within it. Therefore, the correct definition of the expected goal of solving the problem and the tasks in its implementation will benefit more than the efforts to solve the problem immediately;

New ideas, in which students draw their own conclusions, are the main "product" of creative lessons. However, finding a new solution to the problem alone should not be the last stage of creative activity. Students learn to "finish" their ideas, that is, to acquire certain skills to try, justify and implement a new solution, to raise creativity from the level of "imagination" to the practical level forms the necessary basis. Another important aspect of this review is that it prepares the ground for ensuring a high level of activity of students in the later stages of education and, ultimately, for educating future scientists who will conduct in-depth research in various fields of science;

An important aspect of the establishment of creativity is related to the collection, analysis and interpretation of information, without which any method of creativity loses its significance. Methods of involving students in the collection, sorting and systematization of pictures and photographs, popular science articles, stamps, etc. of their interest can be widely used in the formation of basic skills in working with information;

A very important issue in terms of the scope of classes in educational institutions, which goes beyond both in-class and out-of-class classes, is the development of personal creativity. Usually when talking about great scientists and inventors, students try to avoid trying to say, "Only great scientists have achieved such great things, and we are ordinary people." One of the important ways to overcome this notion is to acquaint students with the biographies of famous artists with different lifestyles, in which all aspects of the life of the person in question are described. At the heart of this method is the need to inculcate in students the idea that the highest achievements in science can be achieved by anyone who aspires to it.

These methods of organizing creative activities can be used effectively for students of different ages, but only if there is a systematic set of relevant programs and textbooks. So, the next urgent task is to create a training and methodological package that will serve the effective implementation of the methods outlined in the article. The logical sequence of solving creative problems. To solve any problem, first of all, it is necessary to clearly define the intended purpose and to find the most effective methods of solving it within the available opportunities. Creativity issues can be solved on the basis of a logical sequence in the form of "Goal - the available opportunities to achieve the goal" as follows. In this case, the concepts of problem, problem and its current state are determined on the basis of the goals and conditions set in the general case.

The problem of creativity usually takes the form of: "[A] conditions are given, [H] is required to achieve the goal." We write the problem conditionally in the form of a logical expression [A, H]. But when applied to certain conditions, this logical sequence takes different forms, as we can see in the following examples.
Example 1. Given: technological process, scope and timing of work, agrotechnical requirements, description of soil and crop area, the limit value of the pressure of the mechanisms on the soil. A new technical solution is required for the combined processing unit, which will minimize the amount of operating costs per unit of crop area.

The current state of the problem is characterized by the given conditions, i.e. it is an incomplete problem in the form [A, -]. The problem is a complex, incomplete problem in which the conditions are not defined, i.e. [-, H]. Research is needed to solve the problem. 2 - example. Solution: An internal combustion engine needs to find a new technical solution that can reduce fuel consumption by 10 percent. The current state of affairs should be analyzed and a conclusion should be drawn based on the data obtained, i.e. [-, H]. The problem is to analyze the existing technical solutions that allow to save fuel and determine the direction of research to reduce consumption.

Methods used in the process of technical creativity. With the advent of the first technical devices and simple mechanisms, humanity is trying to solve technical tasks that are important to it in various difficulties. In order to meet the growing needs of mankind and to facilitate labor, it seeks to create new machinery and equipment, increase its productivity and increase its efficiency. It has long been understood that only talented people are engaged in creativity. The growth of science, science and technology shows that the development of scientific and technological progress can be ensured only through the training of a large number of specially trained people. The need for industrial production is one of the important factors in accelerating the development of technology. The same idea can be applied to technical creativity.

In the 1940s, there was a growing need for active methods of researching technical solutions. The lack of methods in this area had a negative impact on the development of nuclear energy, rocketry, the development of electronic computers. During this period, as a result of research in various areas, the following cases were identified:

- First, the fact that even geniuses can not solve complex problems on their own, the need for a collective approach to creativity;
- secondly, given the short time allocated for the development of technical solutions, scientific research should be carried out continuously in conjunction with the development of new ideas;
- Third, to identify ways to distinguish between the many available ideas that are reasonable and effective.

“Operation and error" methods. To learn to create, you need to know his abilities. In the past, during the period of armaments, only one method of "action and error" was used in the invention. In their work processes, they make many mistakes when performing various actions in solving technical problems, and use exactly the "Action and Error" methods to eliminate these errors. Its essence is that in solving technical problems, the inventor chooses one that meets the cast demand, using all the

available options. The ingenuity, intuition and intellect of the inventor are more important in solving technical problems.

Advantages and disadvantages of the method "Action and error". The disadvantage of the "action and error" method is that it is very difficult to create a methodology for its use. In solving each new technical problem, the inventor has to start anew. The "action and error" method requires a lot of hard work and its use does not guarantee successful solution of problems. In the context of scientific and technological progress, the rapid development of technology requires the use of methods that have a great idea and great impact. However, experience shows that in all methods used to solve technical problems, elements of the method of "operation and error" are used to some extent.

“Mental attack” method. According to scientists, creative activity is based on a clear law, which makes it necessary to find adequate methods for solving creative problems. These methods are divided into 2 groups. The first group is based on the methods of "Brainstorming", "Synectics, morphological analysis", which are based on the mechanisms of associative thinking and the nature of the unexpected solution. These methods are very easy to use, but do not depend on the nature of the object being used. The second group includes "Algorithm for solving inventive problems", "Functional-cost analysis" and others. The use of these methods is very complex but is aimed at revealing the essence of the object. As the need arises on the scientific basis of manufacturing enterprises, it will lead to the development of science in many research institutes. In the mid-1990s, the rapid development of nuclear energy, rocketry, electronic computing, and the rapid development of machines began to search for ways to organize creative labor on a scientific basis. They were carried in different directions.

One of them was the "Brainstorming" method proposed by the American entrepreneur and inventor A. Osborne. In his opinion, if someone has the ability to give ideas, someone has the ability to give a critical analysis. He suggests dividing them into two groups, namely "Generators" and "Experts". Developed the following rules for using the method of "mental attack":

- 12-25 people should be involved in solving problems using the method of "mental attack". Half of them are ideologues, the other half are analysts. The group of generators of ideas includes people with a strong imagination, abstract thinking. Analytical and critical thinkers will be selected for the panel of experts. The Brainstorming session is led by a qualified, experienced staff member.
- Generators give the maximum number of ideas to find a solution to a cast problem. The description of the given ideas is recorded on a tape recorder. Experts will choose the best of them.
- Depending on the severity of the problem, the "Session" can last up to 30-50 minutes.
- It is necessary to establish a respectful and free attitude towards each other among the employees participating in the "mental attack" session.
- If the session ends without a result, it is necessary to change its participants. It is also advisable to reconsider the issue.

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