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TECHNOLOGY TO DEVELOP STUDENTS' TECHNICAL THINKING IN TECHNOLOGY CLASSES.

Pardabaev Jasur Eshbekovich
Teacher of TSPU named after Nizami
jasurov.84 @mail.ru
+998901780894
Muxammedsaidov Bakijan Karimovich
Teacher of TSPU named after Nizami
Daminova Ra'no Basitovna
Teacher of TSPU named after Nizami

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Abstract:
This article discusses technologies for the development of students' technical thinking in technology lessons, innovative teaching technologies, robotics, modeling, design, and the formation of engineering skills.

Keywords: Technical thinking, engineering skills, mechanism, transformation, data collection, technical modeling.

INTRODUCTION

The development of science and technology in the world, the importance of human intellectual potential in managing the socio-economic development of the country and determining its future. At the same time, the current state of science development in the world, especially in a society where the education of young people is widely introduced, requires the rapid renewal of knowledge in various fields, the rapid acquisition of knowledge, as well as regular and independent search for knowledge. In the modern context of educational development, the task of developing students' ability to act quickly in new, non-standard situations, to analyze existing sources of information and to change the surrounding space is urgent. This requires a high level of technical thinking.

"Technical thinking" is very interesting and relevant today. This is due to the rapid and multifaceted development of science, the constant change and complexity of technical means in production, the renewal of interests in engineering specialties, including at the state level.

RESEARCH METHODOLOGY

Some aspects of the problem of shaping technical thinking have been traditional for psychology, pedagogy, and philosophy since ancient times. Aristotle's works reflect the existence of two types of thinking: theoretical, universal-oriented, and practical, requiring the application of universal laws in specific situations.

Such views have existed for a long time, and only with the growth of the mechanical processes on which production is based are G. The mechanical view of natural processes and the views opposed to practical, technical thinking, proclaimed by Galileo, were empty and ineffective. Gradually, practical technical thinking began to be interpreted as a noble profession, a vital activity aimed at changing the environment, designing and producing the material parts of life.

The term "technical thinking" was first defined by the philosopher P.K. Engelmaer in his "Philosophy of Technology" as "there is a special consciousness that can be called technical."

The term "technical thinking" has emerged very recently in the psychological and pedagogical literature and is intuitively understood by many authors as T.V. Kudryavtsev, one of the first researchers of this problem, points out that technical thinking has a three-component structure: Figure 1

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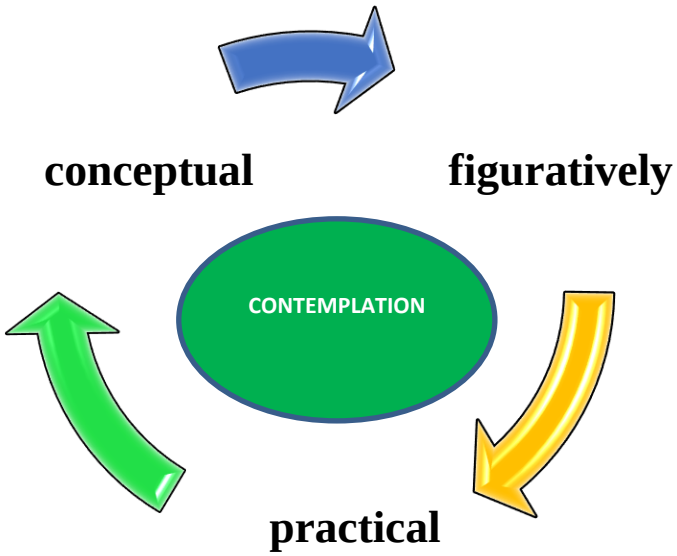

Figure 1: **Components of technical thinking**

In this case, each of the components occupies an equal place, and together they form an integral unit.

By studying the characteristics of mental activity in solving structural and technical problems, he identified specific operations and skills specific to technical thinking - structural and functional analysis, synthesis of built-in elements of the technical device, revision of technical objects, functions that allow to identify hidden properties of objects and find solutions. problems.

Successful solution of structural and technical problems depends on the perception of graphic images (visual and technical means), the ability to work with dynamic spatial images. The emergence of such concepts significantly simplifies the process of designing machines and mechanisms. Dynamic spatial images allow you to see spatial connections and relationships between parts of a device. Successful solution of various constructive and technical problems is one of the indicators of the development of technical thinking.

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In our view, technical thinking is "an integrated set of mental and practical actions" Figure 2.

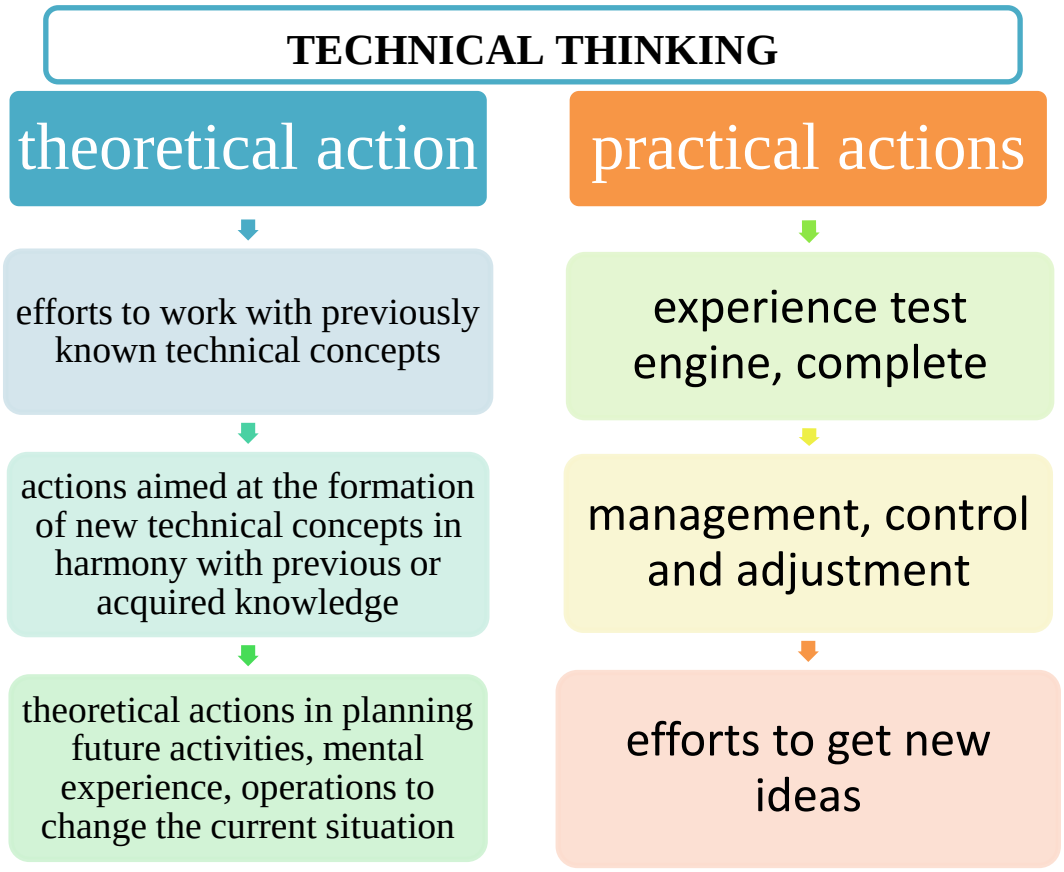

Figure 2: The structure of technical thinking

The structure of technical thinking is associated with three interrelated and equal parts - conceptual, figurative and practical, where the conceptual (theoretical) component provides the formation of technical concepts, figurative (visual) - contributes to the emergence of a system of images and skills, practical (effective) component requires mandatory verification of the results obtained.

Technical thinking as a combination of different components is manifested as follows:

- Perceptions of nature, society, modern technologies, description of the modern scientific and engineering landscape of the world;
- Ability and skills to apply knowledge in the field of technology in various practical situations;
- as the ability to acquire new knowledge, analyze the results of production activities, if necessary, to regulate the production process.

Technical thinking is an important component of vocational training that is formed in a systematic, consistent, continuous learning process. Technical thinking is not only ideas about the world's engineering landscape, but also skills. Types of thinking are different, and in our understanding - these are complex types of specific practical activities, such as mathematical activities, technical activities, technological activities, and so on.

In this regard, we have divided the basic skills appropriate to the type of technical thinking into:

- modeling ability (creation of information models of technological processes and events, substantiation of their various variants on the basis of the rule of obtaining the final result of the activity "Reasonable-optimal");
- the ability to apply knowledge from one field of science to another to comprehensively describe different types of technological situations;
- the ability to build causal relationships, to move from one level of generalization to another in solving technological problems;
- the ability to find common ground for combining different disciplines and get a general idea of the technological world;
- ability to receive and modify data (use of different data sources to solve different technological problems);

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- ability to self-assess based on the reflection of their activities and results;
- the ability to perform design analysis and synthesis of the object of transformation in solving the problem;
- the ability to determine the readiness of man, society and nature for transformational activities in the context of change;
- ability to make technological decisions and apply them in practice;
- the ability to consciously and creatively choose the best methods of alternative transformational activities, taking into account the consequences for man, society and nature;
- To teach students to think technically on the basis of heuristic tasks based on the ability to plan and predict transformational activities.

Thus, it is clear that the success of the process of formation and development of the technical thinking of the student's personality depends on the implementation of the principles of continuity and consistency in the multi-level educational space.

The main task of technical thinking is to solve a problem. Technological problems are characterized by the following three aspects:

- First, a clear goal, the desire to get an answer to the question;
- secondly, the need to take into account the existing conditions, the initial data on the achievement of the goal;
- Third, the use of problem-solving methods that meet existing conditions.

Each of these three points has a number of characteristics, and the student must be able to clearly and competently answer the questions he or she needs to answer independently or with the help of the teacher in the process of solving the technological problem. In addition, conditions, initial data are not always given in a ready-made form, many of which must be found independently to determine whether they are sufficient to solve a technological problem. However, the biggest challenges are related to ways to solve the problem. It is well known that the methods of solving any problem are based on the application of general principles in certain circumstances, the completion of a particular work according to a certain general rule.

CONCLUSION AND SUGGESTIONS

Technological thinking skills are acquired by students as a result of practice in technology classes. While working on the machine, the student spends a long-time making ready-made technological maps or various parts according to the teacher's instructions. During a long practice, the student performs the same tasks many times. As a result of this repetition, students gain experience and develop technical thinking skills.

Technical thinking means thinking not only under the influence of social conditions, but also under the influence of the development of social needs, the requirements for the development of material production and the socio-historical prospects of the development of society. Thinking always refers to an evolving system of knowledge on a topic.

The meaning of technical thinking is to solve problems, and in the process of solving them the necessary qualities of technical thinking are formed.

There are specific features in solving technological or design problems, and in the process of work a person should be able to ask questions independently, clearly and competently.

The development of technical thinking is a complex process, usually very slow, and depends on mental, practical skills, a person's technical thinking ability, and other factors.

Another important way to develop technical thinking is a creative project in technology classes. It is a task of study and labor, resulting in the creation of a product with subjective and sometimes objective innovation.

Creative projects for the production of high-demand products in accordance with the requirements of social and scientific-technical development require knowledge and entrepreneurial skills. It develops not only the content but also the personal characteristics in the students. Learning projects involve a problem that requires a solution that means forming one or more tasks. It should be engaging in shaping the task and encouraging increased motivation for project activities.

Another important object of technical thinking development is technical modeling - it is an independent creative activity to create models and models of technical objects that form technical knowledge and skills in the learning process, gain experience of teamwork, develop artistic and aesthetic taste.

Let us consider one of the ways of forming technical thinking, which is carried out through the extracurricular form of educational activity, which generalizes the technical direction of "rocket modeling".

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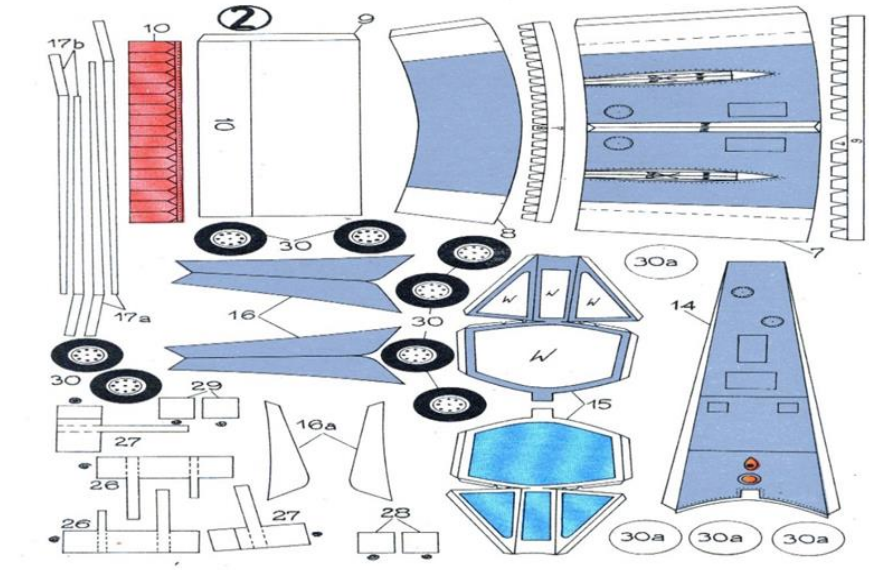

Rocket modeling is a practical result of the creation of model missiles for research and sports purposes.

In modeling, students learn about the aerodynamics and ballistics of flight, the design and construction of flight models, thermodynamics, materials science, the power and performance of rocket models, production technology, the history of jet technology. This lays the groundwork for school students to have a conscious, deep understanding of physics, mathematics, chemistry and other academic subjects.

One of the important tasks of rocket modeling educational activity is the formation of technical thinking in students, in which students form the following personal and social competencies:

- self-education, self-development;
- development of curiosity and interest in the study of technology and technical sciences;
- development of intellectual and creative abilities;
- formation of a responsible attitude to work;
- formation of motivation for further study of technology.
- to compare their actions with the planned results, to monitor their activities in the process of achieving the result, to determine the ways of action within the proposed conditions and requirements, to adjust their actions to the changing situation;
- ability to create, apply and modify symbols, models and schemes to solve learning tasks;
- the ability to assess the correctness of the task, their ability to solve it;
- methods of working with information, including the ability to search and select sources of information in accordance with the educational task, as well as the ability to understand the information given in the form of various symbols - tables, diagrams, graphs, charts, etc.

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