



ISSN: 2350-0328

**International Journal of Advanced Research in Science,  
Engineering and Technology**

**Vol. 9, Issue 1 , January 2022**

# **Development of Technical Thinking of Cadets using Interactive Methods**

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**ABSTRACT:** The article proves the necessity and importance of the development of technical thinking based on the identification of dominant (different) pedagogical conditions for the systematic development of the elements of technical thinking in the process of training military personnel, as part of the structure of educational activities. In the process of solving operational problems, the interaction of elements of mental activity (conceptual, figurative and practical) is improved by supporting technical innovation and prioritizing the systemic-structural aspects of divergent (problem) thinking.

**KEYWORDS:** technical thinking, individual characteristics, technical analysis, technical considerations, cadets "technical thinking", training of military engineers, the field of daily activities, the important professional quality of cadets engineering.

## **I. INTRODUCTION**

The problem of training officers who will be able to compete with military personnel of foreign countries and improve their defense capabilities in the future is as relevant as ever. After all, the peace and prosperity of our country depends on the activities of all future military personnel who consider the defense of the homeland as their honorable duty, serving in our country and currently studying in military educational institutions.

The ever-increasing development of engineering and technology, the expansion of scientific innovations in the world, the ongoing cooperation between foreign countries in political, economic, educational and other fields place a high demand on education, including higher military education. To do this, pedagogical staff of higher military education institutions, realizing this situation, must identify the main tasks ahead [1].

## **II. LITERATURE REVIEW**

Issues of military art, construction, development, combat readiness and combat capability of the Armed Forces of the Republic of Uzbekistan and military pedagogy and psychology, military education and training methods, content, organization and methodology of educational process, theory and practice of military work AA Ergashev, UA Muysinaliev, Sh.M.Abdullaev and AIIkramov are reflected in research work.

At the same time, at present, insufficient research has been done to develop the technical thinking of military personnel in the process of training them for professional activities. From the analysis of the results of research conducted by researchers in non-military civilian areas, it is known that there are many research papers devoted to the study of specific approaches and specific aspects of this problem, mainly aimed at solving the problem of professional development.

## **III. FORMULATION OF THE PROBLEM**

The essence of the ongoing reforms in the field of education in the world is to cultivate high-quality and competitive personnel, and the further development of this sector is to train personnel who can compete with qualified personnel in foreign countries.

Scientific research has been conducted on the development of professional competence of military specialists, their technical thinking, improvement of technological, engineering, research, organizational, management and production and methodological aspects of professional competencies, training of future military engineers in the spirit of military patriotism. The development of technical thinking of future military engineers is of great importance for the



ISSN: 2350-0328

## International Journal of Advanced Research in Science, Engineering and Technology

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effective organization of interactive education, modernization of the military-engineering education system on the basis of advanced pedagogical technologies, the introduction of modern pedagogical technologies in the educational process.

There has been a lot of scientific research on this topic around the world, and the results of this research have been interpreted with a number of practical recommendations and suggestions.

Leading research centers and higher military education institutions in the United States, France, Germany, the United Kingdom, Russia have implemented advanced innovative mechanisms to develop and assess the competence of future officers, integrate them into the social environment and further increase the efficiency of the educational process. In this regard, the meeting of the Shanghai Cooperation Organization on November 10, 2020 focused on regional security and military training. Training of military engineers requires improvement of the basic content, forms, methods and teaching aids of military education, orientation to practice, application of recommendations given in the educational process as a result of interaction with service and daily activities. In this regard, it is important to use the experience of qualified professionals in the process of comprehensive training and education of future professionals in the development of educated young people who are masters of their profession [2, 3].

The first task in this section of the study was to study the impact of technical thinking on the developmental dynamics, which is an important professional quality of a cadet engineer. In order to ensure that the data obtained were not one-sided, it was decided to compare the data obtained from the cadets with the responses provided by the "standard" group. Opinions of teachers and professors on the features of the development of technical thinking among cadets are important in the development of ways to improve the learning process.

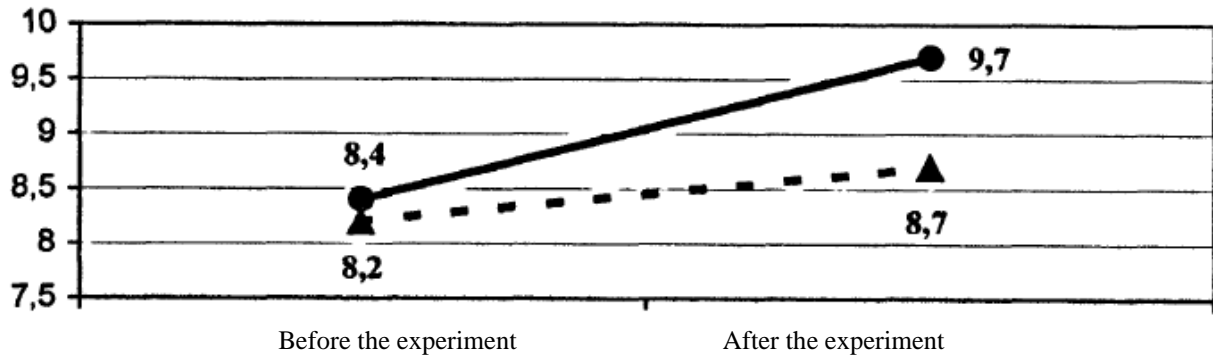
The following:

- How do cadets understand the term "technical thinking"; whether they consider it an important professional quality; how well they understand the process of developing their technical thinking;
- We are interested in how teachers reflect the content of the concept of "technical thinking", how they imagine the laws of their development, what methods of psychological and pedagogical influence are considered by future engineers to be the most effective for the development of technical thinking.

When we asked about the definition of technical thinking: we realized that the cadets did not know the exact definition of it and would define it to the same extent, in terms of daily life. In this case, we see that R. We used the approach applied by Sternberg to study the essence of intellect - we analyzed the usual way of thinking on a daily basis. In order to clearly understand the empirical data, it is necessary to activate the definition of the concept of "thinking" and provide a brief introduction to the technical thinking presented in paragraph 1.2 [4, 5].

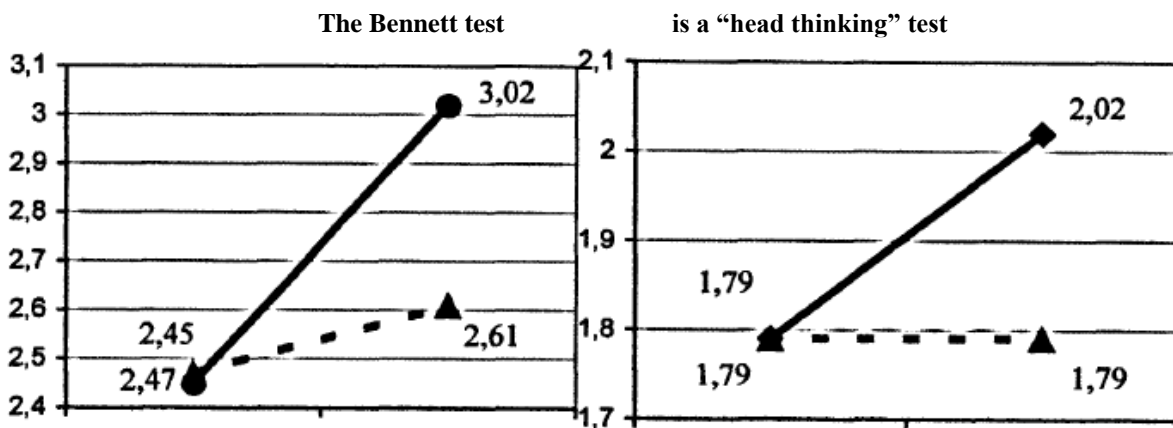
Four categories of understanding the essence of "technical thinking" were identified, according to which the answers were distributed accordingly:

1. "Thinking processes" (47% of answers), mental processes of reflection of reality, the highest development of individual creative activity, as well as the purposeful use, development and enhancement of knowledge;
2. "Abilities" (41.9% of responses) - are specific individual characteristics of the individual, which are the conditions for the successful implementation of any activity or several types of activities;
3. Denial of the legitimacy of the term "technical thinking" (7.1% of responses). It is possible to understand the scope of thinking of these respondents. To date, it has not been found in any technical intellectual practices (technical analysis, technical synthesis, etc.), nor in specific technical considerations or conclusions. On the other hand, it is impossible to deny that the nature of the thinking process changes due to the characteristics of the technical material (object of activity), the way the subject acts with this material and the conditions under which the activity itself takes place.
4. "Unclassified definitions" (4% answers). These definitions were not included in any of the first three categories because they were metaphorical (or "look at the root") or because the response to the spiritual content of the statement was too short (Figure 1).



**Figure 1. Diagram showing the dynamics of growth of technical thinking of cadets experimental groups; control groups.**

We can also see an increase in technical thinking in the experimental groups when interactively examined using Benneta and “head thinking” tests (Figure 2).



**Figure 2. A diagram showing the growth dynamics of technical thinking using Bennett and “head thinking” tests experimental groups; control groups.**

#### IV. METHODOLOGY

Analysis of the data shows that the mean value of the technical thinking obtained in Phase 1-2 of the study differed by 3.6 units, which is 5% of the maximum possible unit of value on the test [6, 7]. These differences are statistically significant on the Student Criterion. Distribution of cadets according to the level of technical thinking In Phase 2, the number of cadets with very low, low and medium results decreased, but the number of cadets with high and very high results increased. ch2 - check of statistical significance on the criterion, which is observed in the differences in the distribution by levels Table 1. In turn, the growth of the indicators under consideration allows to imagine the presence of a developing effect in the learning process (Figure 3).

Table 1.  
The initial level of formation of technical thinking in cadets.

Groups/ degrees	Experimental test groups n <sub>2</sub> = 110 people			Control groups n <sub>1</sub> =110 people		
	high	average	feeble	high	average	feeble
At the expense of people						
The level of development of technical thinking						
Before the exsperiment	34	49	97	36	42	94
of %	18%	28%	54%	21%	24%	55%

Hence, as can be seen from the diagram, the difference between the initial mastery indicators of the experiment is almost insignificant. This, in turn, reflects the relevance of the issues raised in the research work.

As can be seen from Table 1, the level of development of technical thinking in cadets is not at the level of demand. This necessitated the development of a scientifically-based methodology for the development of technical thinking of cadets in the process of professional activity in the later stages of our research work. [8, 9, 10];

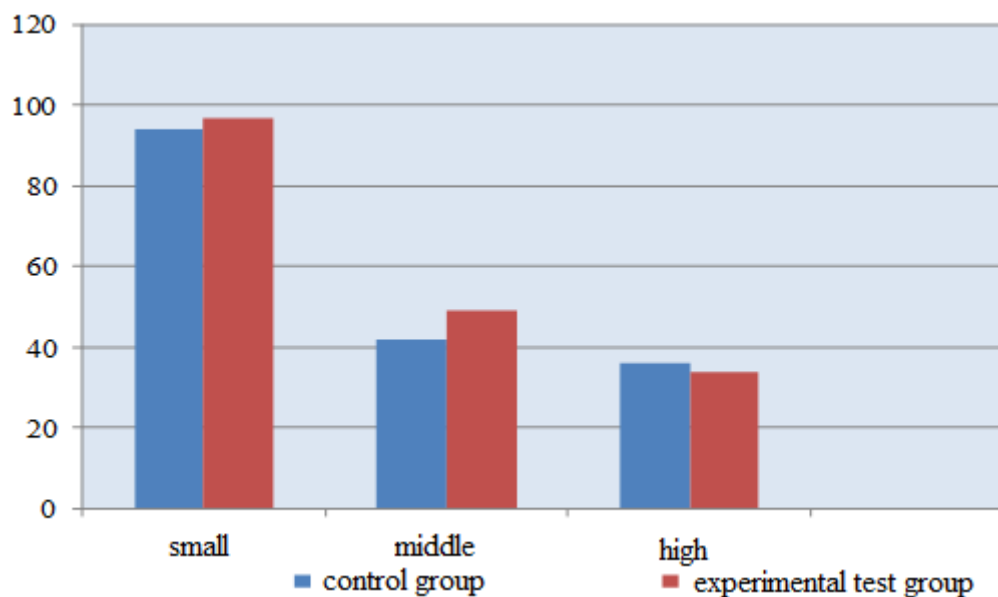


Figure 3. Diagram corresponding to the selections

The last stage. As the cadets 'level of awareness and awareness increases, the emphasis will be on applying existing theoretical knowledge to practice. That is, the knowledge gained and the skills formed will be applied to the practice of an independent technical field. In this process, it is planned to use the technique of "Assistance".

At the end of the experiment, the level of development of technical thinking of cadets was as follows (see Table 2).

Table 2.

Indicators of determining the level of effectiveness of the development of technical thinking in cadets (results of experimental and control groups at the end of the study in numbers and percentages).

Groups/ degrees	Experimental test groups n <sub>2</sub> = 110 people			Control groups n <sub>1</sub> =110 people		
	high	average		high	average	
At the expense of people						
The level of development of technical thinking						
Before experiment %	34	49	97	36	42	94
	18%	28%	54%	21%	24%	54%
After experiment %	47	66	67	37	40	95
	26%	36%	37%	22%	23%	55%

Based on the results of Table 2, the indicators of the development of technical thinking of cadets in the experimental group were high.

The following diagram also proves this. According to the table above, the mastery of the experimental and control groups to determine the initial and final results of the experiment to determine the level of effectiveness of the development of technical thinking was analyzed using the mathematical-statistical method on the above criteria. 180 trainees participated in the experimental group and 172 trainees in the control group. The essence of the problem is as follows: two general sets are given, one of which is the average score of knowledge of cadets in the experimental group, and the other is the average score of knowledge of cadets in the control group.

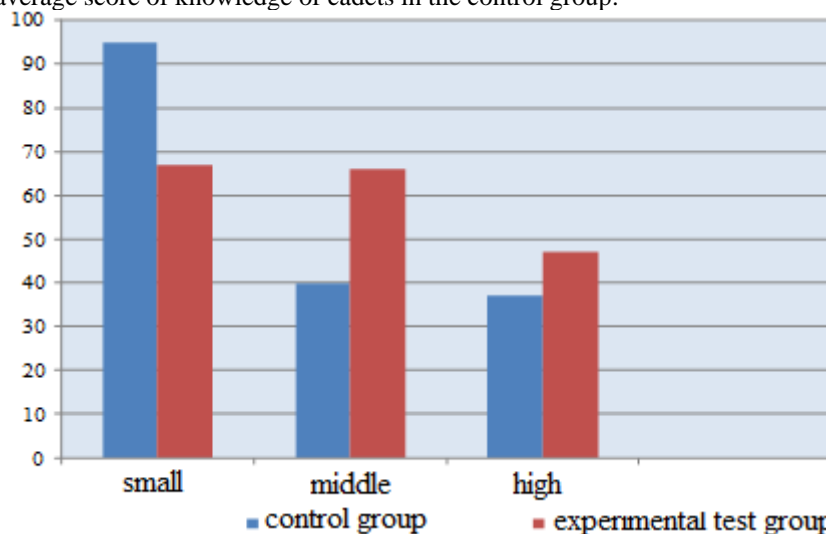


Figure 4. Diagram of indicators of mastering of control and experimental group cadets

Grades are considered to have a normal distribution. Such an assumption is valid because the conditions for approaching a normal distribution are simple and they are fulfilled [11].

### V. METEOROLOGICAL AND LOAD CALCULATIONS

The scientific significance of the results of the study is the identification of pedagogical conditions aimed at the development of technical thinking in the training of military personnel; Development of methods for the development of technical thinking of future military engineers on the basis of mathematical laws and the development and implementation of a training package on "Hydraulics and hydraulic machines" for training future engineers in the education system on the basis of new pedagogical technologies. explained by



ISSN: 2350-0328

# International Journal of Advanced Research in Science, Engineering and Technology

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The practical significance of the research is determined by the formation of a methodology for the use of innovative technologies in the development of technical thinking, the development of a textbook "Development of technical thinking of cadets in the process of training" for future military engineers [12, 13, 14].

## VI. RESULTS AND DISCUSSION

A science-based system for the development of technical thinking, methods, is the basis for creating programs of specific pedagogical interventions that provide impact by teachers. Includes technical thinking model and components. A set of organizational and methodological measures has been developed for them to ensure the targeted and effective development of technical thinking.

The development of technical thinking in future engineers requires a lot of work, but only with a systematic approach will the trainee be able to master, understand, understand and apply all the technical knowledge in their field. Understanding of technical knowledge, "establishing a relationship" with technology is the purpose of technical training of cadets.

The conditions for the implementation of the developed model are: involvement of cadets of higher education institutions in the process of developing technical thinking; clear division of functions between different levels of managers and teachers.

A key factor in the implementation mechanism of the proposed model is the awareness of all participants in the process, including cadets, and the results of the development of technical thinking.

Technical thinking prepares future engineers for production practice, which is the main stage of professional training, forming the knowledge of the specialty.

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