ISSN 2181-371X
SJIF 2023: 5.305 VOLUME 2 ISSUE 10
INNOVATIONS IN TECHNOLOGY AND SCIENCE EDUCATION

FORMATION OF PROFESSIONAL THINKING AND SKILLS OF A FUTURE ENGINEER

Suyunova Yulduz Akhmatovna
Karshi Engineering Economic Institute

Abstract. In the article the intellectual components of the activity of a future engineer, the conditions for the formation of technical thinking in a technical university are studied.

Keywords: technical thinking, method, system analysis, technology, creative thinking.

INTRODUCTION

Psychologists have made attempts to penetrate the secret of the highest manifestation of technical reason - invention (S. M. Vasilevsky, A. P. Nechaev, P. M. Yakobson, A. F. Esaulov, A. V. Antonov, Ch. M. Hajiyev and others). A tradition of philosophical understanding of the nature of technical creativity has developed, where it is regarded as a historically developed embodiment of the creative capabilities of man (I. I. Lapshin, M. A. Bloch, B. M. Kedrov, G. Ya. Bush, S. N. Semenov and others).

The formation of professional thinking acts as one of the components of higher professional education.

MATERIALS AND METHODS

Intellectual components of human activity with technical objects of real production were studied earlier. These problems at the general or aspect level were touched upon in works on psychotechnics, labor psychology (O. Lipman, S. G. Gellershtein, A. K. Gastev, A. A. Smirnov, P. I. Ivanov, E. V. Guryanov, V. V. Chebysheva, K. K. Platonov, E. A. Klimov, E. A. Mileryan, Z. A. Reshetova, V. A. Molyako, etc.).

The term “professional thinking” has been used relatively recently, since the second half of the 20th century, due to the significant intellectualization of social labor caused by the scientific and technological revolution. The concept of “professional thinking” is used in two meanings: when they want to emphasize the high professional and qualification level of a specialist (“qualitative” aspect of thinking) and when they want to emphasize the peculiarities of thinking in professional activity (subject aspect) [1].

Most often, the concept of "professional thinking" is used simultaneously in both senses. It is customary to talk about the technical thinking of an engineer, a technical worker, the clinical thinking of a doctor, the spatial thinking of an architect, the economic thinking of an economist and managers, the artistic thinking of art workers, mathematical thinking, the physical thinking of scientists working in the relevant fields of science, etc. Intuitively, we mean some features of a specialist’s thinking that allow him to successfully perform professional tasks at a high level of skill: quickly, accurately, in an original way to solve both ordinary and extraordinary tasks in a certain subject area.

RESULTS AND DISCUSSION

Along with the professional tasks that a specialist solves, there are a number of requirements for his general intellectual development, his ability to delve into the essence of the problem, see the best solutions, anticipate and predict, which requires a systematic approach to organizing the acquisition of professionally demanded knowledge. The psychological foundations of the information basis of learning are being developed, the formation of systemic thinking as the ability to see an object from different positions, to solve problems creatively, independently, at the level of orientation in the whole complex of connections and relationships [2].

The information basis of training in the system of higher professional education requires the analysis of psychological mechanisms that provide the subject of the

educational process with the assimilation of all the material, its successful use in their future activities.

The idea of the connection between thinking and acquired knowledge, put forward by L. S. Vygotsky [3, p. 384–396], has become one of the fundamental in the activity theory of learning. This connection is revealed through the organization of the method of assimilation as a specific activity that “reproduces” knowledge about the object. The method of organizing cognitive activity as a systematic study of the subject determines the content of acquired knowledge about it, becoming a way of thinking. The approach is based on the principle of consistency, the construction of a conceptual system that describes the subject of study within the framework of the classical scheme of system analysis. Each element of knowledge acquires its functional meaning and meaning only in the system, in integrity, in connection with other elements.

The cognitive activity of students of technical universities in the process of assimilation of systemic knowledge acquires a reflexive character, knowledge becomes an object that functions according to its own laws. The acquired method of acquiring and appropriating knowledge becomes a way of organizing thoughts about the subject. The productivity inherent in creative thinking is the result of the upbringing of thinking in a certain way to explore the object, reflecting systemic connections and relationships in it [3].

From the 60s. the research of technical thinking is being developed, which are conducted in a professional aspect, as features of the thinking of a person included in the management of large systems, as features of design thinking, thinking of generalists. The problem of technical thinking is posed in the same way as the theoretical problem of "technical intelligence" -“a special type of intellectual activity” (V. A. Kan-Kalik, V. P. Simonov, V. A. Slastenin).

To solve complex professional problems, an engineer must develop creative thinking, including both an integrative way of thinking (B. G. Ananiev, V. N. Maksimova) and an innovative way of thinking (V. I. Zhernov, V. A. Slastenin).

The conceptual ideas of prominent psychologists on the problem of thinking (L. S. Vygotsky, V. V. Davydov, S. L. Rubinshtein, D. B. Elkonin, etc.) were the basis for the development of theoretical and experimental approaches to the development of thinking (P. Ya. Galperin, V. V. Davydov, L. V. Zankov, N. A. Menchinskaya and others).

1. Identification of individual features (or their different combinations) that characterize the performance of practical activities: independence in the preparation and solution of practical problems, a wide variety of tasks to be solved, the creative nature of their solution, performance with an understanding of functional dependencies between visible and invisible processes, etc.

2. Explanation of the features of technical thinking by the stock of technical knowledge and the method of their assimilation (first of all, the importance of knowledge in physics and technical mechanics is noted).

3. The connection of technical thinking with the general abilities of a person: a wealth of concepts, the ability to combine, reason, establish logical connections, the ability of attention, spatial transformation of objects, etc. [4, p. 104–110].

Scientists associate technical thinking with personality traits: the presence of technical interests, the importance of technical thinking for a person, age characteristics of a person.

The professional thinking of an engineer of the 21st century is a complex systemic formation, which includes the synthesis of figurative and logical thinking, scientific and practical, technical thinking. In the activity of an engineer, these styles of thinking are combined, the equality of logical and figurative-intuitive thinking, of the right and left hemispheres of the brain, is noted. The development of imaginative thinking of an engineer also requires art and cultural training. Mastering the basic fundamental sciences plays an important role in the development of scientific thinking.

Technical activity consists of the design of equipment and the manufacture, operation of equipment. For modern design, the principles of minimizing

environmental damage are relevant; ergonomic consideration of the psychological capabilities of a person and the creation of convenience and safety for his work with technical means; aesthetic principle of convenience and beauty.

The thinking of a modern engineer and highly skilled workers of the 21st century is becoming more complicated, it includes the following types of thinking: logical, figurative-intuitive, practical, scientific, aesthetic, economic, environmental, ergonomic, managerial and communicative [4, p. 115–122].

The practical component, performing the function of testing the theory with practice, confirming its truth, stimulates further movement of thought to test practice with theory. The speed of transition from one plan of activity to another - from verbal-abstract to visual-effective, and vice versa - stands out as a criterion for the level of development of technical thinking. As a thought process, technical thinking has a three-component structure: concept - image - action (with their complex interactions).

CONCLUSION

Thinking is one of the forms of orientation. The specific features of thinking, as noted by P. Ya. Galperin, are that this activity is regulated by orientation in a conceptual form, which reveals a new reality to the subject, due to which it becomes possible to solve “thinking” tasks. Levels of abstraction and generalization are socially fixed by different systems of concepts. Their assimilation and the transition of the subject from orientation in one system of concepts to another - a system of higher abstractions - means mastery of an ever wider reality, expanding the horizons of his possibilities for solving mental problems, in other words, the transition to a new the level of intellectual development [6].

Thus, in the education and training of engineers of the 21st century, for the development of their professional thinking, a reasonable synthesis of fundamental and technical disciplines with economic, social and managerial, environmental, cultural, and psychological sciences is necessary.

REFERENCES

1. Bodrov V. A. Psychological studies of the problem of personality professionalization. - M., 2011. - 122 p.

2. Markova A. K. Psychology of professionalism. - M., 2016. - 218 p.

3. Vygotsky L. S. Development of higher mental functions. - M .: Publishing House of the APN RSFSR, 2010. - P. 384-396.

4. Kudryavtsev T. V. Psychology of technical thinking: process and methods for solving technical problems. - M.: Pedagogy, 2015. - 304 p.

5. Zeer E. F. Psychology of professions. - M., 2001. - 219 p.

6. Galperin P. Ya. Psychology as an objective science - M .: Pedagogy, 2018.

7. Klimov E. A. Psychology of a professional: Selected psychological works. - Moscow; Voronezh, 2016.– 316 p.

8. Povarenkov Yu. P. Psychological content of the professional development of a person. – M.: 2012. – 205 p.

9. Рахматов, З. Н., & Рашидов, Д. Н. (2023). Пути совершенствования механизма разработки маркетинговой стратегии ао «ўзтемирйўлйўловчи». Innovative achievements in science 2022, 2(17), 55-60.