

PHILOSOPHICAL UNDERSTANDING OF ENGINEERING THINKING

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**Abstract:** The phenomenon of "engineering thinking" is the object of study of many disciplines: philosophy, psychology, pedagogy, humanitarian and technical sciences. Engineering thinking should be based on a well-developed imagination and include different types of thinking: logical, creative, visual-metaphorical, practical, theoretical, technical, spatial, etc.

**Key words:** engineering, technique, philosophy, psychology, pedagogy, creativity.

**Annotatsiya:** "Muhandislik tafakkuri" fenomeni ko'plab fanlarning o'rganish ob'ekti hisoblanadi: falsafa, psixologiya, pedagogika, gumanitar va texnika fanlari. Muhandislik tafakkuri yaxshi rivojlangan tasavvurga asoslanishi va turli xil tafakkur turlarini: mantiqiy, ijodiy, vizual-metaforik, amaliy, nazariy, texnik, fazoviy va boshqalarni o'z ichiga olishi kerak.

**Kalit so'zlar:** muhandislik, texnika, falsafa, psixologiya, pedagogika, ijodkorlik.

**Аннотация:** Феномен «инженерного мышления» является объектом изучения многих дисциплин: философии, психологии, педагогики, гуманитарных и технических наук. Инженерное мышление должно основываться на хорошо развитом воображении и включать в себя разные виды мышления: логическое, творческое, наглядно-метафорическое, практическое, теоретическое, техническое, пространственное и т. д.

**Ключевые слова:** техника, техника, философия, психология, педагогика, творчество.

With the help of thinking, a person recognizes the world with all its diversity, characteristics and relationships. Thinking is a part of the psyche, and one of its main tasks is to predict events. Thus, with the help of thinking, a person understands not only the existing, the real, but also the possible, he not only perceives, but also creates it. Philosophy studies the general relationship between thought and matter. Sociology studies the dependence of thinking on the social structure of society and its development process. Logic studies the systematic relationships between basic forms of thought such as concept, reasoning, and conclusion. Patterns of real thinking and its relationship with other mental phenomena are the subject of psychological research. If logic studies the relationship between ready-made, already formed concepts,

psychology is interested in the process of concept formation, in which, for example, it is possible to add properties to things that they lack. Thinking is a socially conditioned cognitive mental process that is inextricably linked with speech and is characterized by a generalized and indirect reflection of connections and relationships between objects in the surrounding reality.

The phenomenon of "engineering thinking" is the object of study of many disciplines: philosophy, psychology, pedagogy, humanitarian and technical sciences. Analysis of the real experience of solving creative engineering problems shows that the basis of engineering thinking is: this is a highly developed creative imagination; systematic creative understanding of fantasy, multi-screen knowledge; the methodology of technical creativity, which allows to consciously control the production process; to have new ideas.

What should engineering thinking be? What kind of thinking should it include? What types of thinking should be included in it?

Engineering thinking should be based on a well-developed imagination and include different types of thinking: logical, creative, visual-metaphorical, practical, theoretical, technical, spatial, etc. The main ones are creative, visual-figurative and technical. As a psychological category, engineering thinking has a conceptual-figurative-practical structure. Engineering thinking is a systematic creative technical thinking that allows you to see the problem as a whole from different angles and analyze the connections between its parts. Engineering thinking makes it possible to simultaneously see the system, the supersystem, the subsystem, the connections between them and within them, and for each of them - to predict the past, present and future. In other words, engineering thinking should be versatile. The more knowledge an engineer has, the more original and simple a solution he can offer. The peculiarity of such multi-screen viewing is that it opens up ways to identify and overcome technical contradictions and physical contradictions hidden in them. At the same time, he deliberately creates paradoxical ideas. Features of engineering thinking include: the ability to identify a technical contradiction and consciously direct thought to an ideal solution, in which the main task of the object is to perform work by itself, without spending excessive effort and money; directing thought in the most promising direction in terms of development laws of technical systems; the ability to control psychological factors; consciously enhance creative imagination.

Engineering thinking is also characterized by the fact that the subject feels the need to develop its design, consciously and purposefully creating an idea. In this case, the idea is transformed into a real project of new equipment, technology, etc. Therefore, the global task of a technical university is to develop systematic creative engineering thinking in students, for which, in addition to the ability to consciously and purposefully create non-standard technical ideas, it is necessary to master the methodology of creativity. This includes the optimal use of the general scientific and

special professional knowledge base in the field of mechanical engineering and technology. In solving practical problems, scientific knowledge is included in various fields of practice. The characteristic of such activity is its creative nature. The focus is on the person, his creative mental activity. The topics of scientific creativity and scientific thinking have long attracted the attention of scientists, philosophers and psychologists. An important place in these studies is the search for an answer to a practical question. How to solve problems. The formalization of knowledge and the use of formalized methods of working with knowledge are the most powerful means of eliminating the problem of reliability and errors.

It is not the content of knowledge, but the mental processes of a person, their organization and the quality of their results that are of particular importance in the search for answers to new questions. Schemes and general concepts that incorporate scientific knowledge and experience can be used to purposefully create new knowledge in the process of thinking and to improve the quality of existing knowledge. A systematic approach to solving creative problems in the field of scientific activity and design practice is formed. The systematic approach is based, on the one hand, on scientific knowledge and methods of solving problems, on the other hand, on the psychological mechanisms of scheme-conceptual thinking, which perform the functions of expressing knowledge, evaluating its quality, and transferring knowledge to new tasks. There is a commonality of mental mechanisms based on a circuitous approach to solving very different problems. It is determined that the main means of organization and transmission of scientific knowledge are concepts combined with conceptual schemes and analogies.

There is a wide range of tasks and problems, each with their own unique characteristics. This determines the important role of human factors in solving them and gives tasks a creative character. Solving these problems is related to human performance. In solving such problems, the mental mechanisms of presentation and transfer of scientific knowledge and experience work with their subjectivity, unreliability, and at the same time production possibilities. In the absence of permanent methods and tools, we create new knowledge from existing knowledge. This is how a person organizes and applies scientific knowledge and experience in his thinking. An objective approach to solving problems is based on the norms and traditions of rationalism. This means that tasks should ideally be clearly defined. Also, the solution methods must have a defined, reasonable, guaranteed result, and the engineer who solves the problem must also think logically.

Philosophical understanding of engineering thinking inevitably reflects social principles, its peculiarities and differences. It also includes well-formed systems, modern philosophical views that fundamentally change science and scholarship. Engineering thinking is related to technical sciences, engineering activities and engineering thinking technologies. New epistemological, semiotic, topological and

other knowledge of science and society also serve the formation of engineering thinking.

Engineering thinking is thinking aimed at ensuring activity with technical objects, characterized as constructive, scientific-theoretical, transformative, creative, social factors carried out at the cognitive and instrumental level.

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