STRUCTURAL FEATURES OF TECHNICAL THINKING

Kuziev, N. M.
Karshi Engineer Economic Institute, **UZBEKISTAN**

ABSTRACT

The most important characteristics of engineering activity are: technical focus, practical goals and objectives, a high degree of creativity, a close relationship with science and humanistic orientation. Main activities: design engineer, design, innovation, an innovation from, camera, documentation control, organizational, research, analytical, consultative, educational, communicative, stimulating. Listed activities depending on specialty, qualification and specific way engineer combined among themselves. Since professional engineering activity is versatile, extremely difficult to establish common requirements for identity of engineers of different areas, occupations and levels. Virtually all researchers engineering activities have come to the conclusion that technical thinking (technical intelligence, design and technical skills) is an essential professional quality important engineer. Handling technical content has an impact on the structure and process of mental activity. From the functional point of view of technical thinking manifested in the process of solving various types of tasks associated with the technique. For technical thinking characteristic of three-component structure: conceptual, figurative and practical components of mental "activity took place on an equal footing and are in a complex interaction among themselves.

Keywords: Structure, technical thinking, components, process engineer, professional images.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

Thinking is a generalized and indirect reflection of reality in its substantive linkages and relationships. Thought process can be seen as the result of the following factors: the time factor; factor result; factor content; factor process; the factor of environment.

Important for the understanding of technical thinking is the question of the relationship between the image and the concept in the process of thinking. In psychology for a long time it was believed that upon switching to more complex forms of cognition of reality shaped characteristics are reduced gradually and exercises thinking disappear altogether. To understand the reason for this confusion, it is useful to refer to the review of the genesis of the individual stages knowledge.

At the level of the sensory cognition perceives the world through sensations, perceptions and views. The main language is the language of reflection of reality spatial structures.

Creative thinking no longer operates separate properties of objects and phenomena, but one of the surrounding world. When this leading role belongs to sensual-clear images with spatial characteristics.

At the level of conceptual thinking, a new language is a reflection tool concept. Items are recognized not whole this monistic, but as something characterized by a particular combination of properties. Inextricably linked concepts of speech caused by dispersal conceivable subject, created an impression of the complete disappearance of spatial characteristics in term thinking.

Most researchers thinking focused on his verbal aspects. Theoretical assumption about the relationship of verbal-logical and shaped components of thinking has been put forward in the writings of S.l. Rubinstein, B.G. Ananiev. Experimental images in thinking have been studied only in the context of genetic development of intelligence as the lower-order phase (compared with the notional), as well as in considering artistic creativity, where they deny it would just That's impossible.

Since technical thinking is done in the process of solving any tasks in the field of technology (inventive, design, technological and otherwise), some researchers came to addressing the specifics of technical thinking with positions analysis of the characteristics of technical tasks. They tried to describe all possible types of technical tasks and categorize them, which would formulate technical requirements thinking.

So, divided all technical tasks on 2 types of [3]: diagnostic (the totality of symptoms resulting from certain causes, set out a number of possible one that matches the given combination of signs); prognostic (establishing the possible consequences when choosing events when you need from several possible solutions select optimal for this combination of conditions).

According to the same author technical tasks appropriate to divide into two other groups: creative (design-technical tasks, tasks for design and streamline technology); not creative (planning and organizing activities, workflow control and regulation).

Therefore, among the technical tasks can be a fairly complex task, but with a low level of creativity (a task using diagrams and image images).

An interesting approach is g. Kaiser, according to which technical thinking exists in three forms: design thinking (understanding, analysis and monitoring of constructive solutions); functional thinking (defining functional dependencies between visible and invisible processes, causal relationships); economic thinking (ability to find the most cost-effective design and technological solutions).

Such approach allows to reveal the technical specifics of deeper thinking, but does not negate the possibility of using other approaches.

Some authors believe that technical thinking as it applies to professional types, is a kind of practical thinking (as opposed to theoretical) and is characterized by the following features [1]:
　　-the need to address the diverse challenges posed by profession;
　　- the high level of uncertainty in the initial situation;
　　- the high level requirements for watchfulness against private details that are indicators of hidden complex processes;
　　-high level of variability of possible solutions;
　　-When solving practical tasks do not necessarily predict the entire course of the decision, since the implementation of the first stage allows you to specify the task to the next level;
　　-high level of ability to quickly move from thought to action and vice versa, because thinking is woven into action and process solutions, which is carried out in conditions of hard time, directly subjected to verification.

Therefore, for the successful solution of practical tasks are important not only knowledge and mental activity, but also sensory and motor skills. And practical skills, according to many

authors, often acquired engineering and technical personnel in the process of long-term practice in not organized, form.

However, the approach to technical thinking, as a variety of practical, leaves the outside attention to the specifics of technical thinking.

However, in a technical mindset is essential, a close relationship between concept and action, i.e. it is a theoretical-practical character, because the very process of technical activities is the process of interaction between mental and practical components work.

Practical components of technical thinking impure by its psychological characteristic that depends primarily on the objectives of the activities. It can be either actions aimed at handling already known technical concepts or actions aimed at formation of new technical concepts, planning steps ahead. Practical action technical thinking also defined the purpose of activity. the following structural feature of technical thinking also arises from the specifics of the technical material: it usually is presented together in visually imaginative and abstract-driven thought form, such as electrical and kinematic scheme. The scheme does not provide information or bulk form it displayed components nor the principle of action and the nature of the work of mechanical devices. The scheme, being a type of visibility, involves treating both knowledge and images.

The happens, firstly, because the content is embodied conceptual schemes using symbols or characters, and each of them carries a connotation. Secondly, the operation of schemes requires visualization of the dynamics of human phenomena and processes are displayed with certain ratios of characters. To understand the schema and learn how to operate it, you must not only attract a variety of knowledge, but also to see the static schema Dynamics phenomena and processes, which implies a complex causal relationships.

Thus, in the course of solving industrial problems we are dealing with a complex structure images, spatial dependencies and relations. These images are in direct interaction and restructuring, i. e. in the dynamics. A large number of scientists showed the crucial role of shaped components of technical thinking.

It should be borne in mind that the images come in two kinds: sensual-pictorial and symbolic. Symbolic are the result of initial coordination sensual-Visual images and verbal elements. The further we move away from the image visually sensual-so increasing the abstract image. This is possible because any thinking process combines verbal and figurative elements, and the increasing generality comes with increased image information.

Shaped component technical thinking can be of two types or their combinations. Firstly, when addressing a number of challenges needed updating or memory representations of imagination. Secondly, in many cases, you need to create images of objects based on their perception.

But no matter how difficult the psychological characterization of the image itself is still handling them is not a specific sign of technical thinking. Close interaction with image only concept can ensure the successful solution of technical tasks. In this sense, we should be talking about concepts shaped characteristic technical thinking as its integral group component.

In complex technological activities considered by the technical components of thinking may be relatively independently. For example, when solving some tasks at the forefront of

advocating concepts-shaped feature technical thinking with respect to the other tasks of a theoretical-practical component.

The researchers could not find facts specifically technical synthesis or analysis. The logical structure of the process, as expressed in its basic thinking operations, apparently everywhere is the same. However, the changing nature of the. This change is due to a number of facts, including the objective features of the technical tasks and the conditions under which the activity flows to address it.

Thus, a critical analysis of earlier studies examined technical thinking revealed the qualities of this type of thinking, the level of which can be diagnosed in the educational process, which is important for increasing manageability process of forming professional critical thinking.

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