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COGNITIVE PEDAGOGY AND COGNITIVE TECHNOLOGIES IN EDUCATION

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Abstract: The history of pedagogical thought contains valuable elements of theory and research on which modern cognitive science relies. As early as the beginning of the 20th century, Maria Montessori emphasized the role of sensory training in mastering students with both concrete and abstract knowledge. She revealed the role of the peripheral nervous system in the recognition of external stimuli. According to her, “spiritual life develops in connection with the central nervous system." She also emphasized the social nature of learning.

Keywords: cognitive psychology, cognitive educational technologies, method, mind maps, concept map method, information distortion, cognitive schemes, informational and cognitive competence, cognitive development.

Psychologists and educators often talk a lot about the instrumental side of education, using the concepts of means, methods and technologies of education. The features of their application in certain conditions are considered, pedagogical efficiency, advantages and disadvantages are evaluated. At the same time, sometimes they forget that this topic is important not only for the teacher, but also for the student, who is a cognitive system that also works with a certain set of tools that increase and develop its cognitive capabilities [6]. The effectiveness of training depends on their quality. The view of the student as a user of the tools of cognition is quite unusual for traditional pedagogy, which considers it mainly as an object of learning. At the same time, the development of pedagogy and psychology in the last decade has led to a new understanding of the processes of learning and the formation of the cognitive and personal structures of a person.

A direction of pedagogy, which can be called cognitive pedagogy, has appeared and is being strengthened. In it, by analogy with cognitive psychology, a person is considered as a cognitive system. The main questions are how, with the help and through what means does a person explore the world, organize himself, realize the history of his life? Cognitive pedagogy differs from classical instrumental pedagogy in that it pays special attention to the cognitive structures and tools of a

person and the ways of their development, in contrast to the behavioral orientation inherent in traditional schools, in which personality characteristics and the productive side of human activity are assessed. No one is seriously interested in how certain results of solving educational tasks are obtained. It is important that the student demonstrates his competence in solving examination problems. This approach has recently been criticized by the general pedagogical community as ineffective, leading to significant waste of school funds and resources. It should be added that the classical instrumental approach, being a variant of behaviorism that implements the "stimulus-response" principle, often leads to personality deformation, reducing its independence and activity.

In order to ensure the effectiveness of the learning process, it is important to understand the features of the instrumental side of the student's cognitive organization. The student solves certain problems with the help of various tools, which include not only "external" tools in their direct physical form (tools, machines, ergatic systems), but also "internal" tools presented in the form of information processing and transformation structures (intelligence, cognitive styles, memory, attention, etc.). Each person has an individual set, which is used with different efficiency in solving a wide class of problems [1].

From the point of view of cognitive pedagogy, it is important to evaluate not only the content side of education, its information basis, but also how the student acquires and uses the tools of cognition to achieve his goals. Note that it is also important what tools the student uses.

Although these issues are resolved in many pedagogical technologies, they are reflected in their methodological foundations, but few of the authors pay attention to the properties of the tools used by the student. There is a general problem of evaluating the tools of human cognition. By what means does a person cognize and transform the world around him? Perhaps this is not at all an effective and poorly adapted tool for solving the class of problems under consideration?! Traditionally, it is only stated that people differ in the properties of their cognitive organization (mind, intellect, abilities), which is manifested in different results of activity [7].

An attempt to improve the cognitive organization of a person is associated with the concept of "development" and is implemented in the pedagogy of development. This is a rather powerful direction of modern pedagogical thought, which makes it possible to build training on the basis of taking into account the effects of the maturation of a person's mental organization, considered as a cultural and historical process. However, the analysis of existing pedagogical technologies in this direction shows that we are dealing to a large extent with a poorly controlled process, in which the main attention is paid to the natural processes of maturation of the cognitive

organization of a person and his personality, and partly developing communication between the student and the teacher. Despite the obvious benefits for pedagogy of the ideas of development and self-development of a person, we note that in development pedagogy the main thing is often overlooked - the quality of the cognition tool used by students, their constructive activity.

The ideas of cognitive psychology and their practical implementation in the field of management have given rise in pedagogy to the so-called "competence-based approach", which declares the required level of development of students' cognitive tools in accordance with the stages of learning and personality development. The competence-based approach involves the assimilation by students not of the sum of knowledge (information), but of various kinds of skills that allow them to act effectively in various situations of professional, personal and social life. This is a form of testological approach that reflects a well-known empirical fact that shows different levels of students' mastery of their cognitive tools. The competent approach is implemented on the assumption that the teacher and students use the most effective of the known methods of solving problems. However, this is a weak argument that contradicts pedagogical practice. It is important not only to achieve the desired result, but also to know by what means and at what cost it is achieved.

The cognitive approach requires special attention to the instrumental sphere of the pedagogical environment, which refers not only to the physical and social factors of learning, but also to the internal activity of students, which generates meta -tools and ways to solve problems. Note that metatools are dynamic mental structures created in the psychophysiological structure of a person to solve a specific problem, and they should be replaced later by more universal and stable cognitive tools. It can be said that a meta -tool is a stage in the evolution of one or another cognitive ability — a human tool. At the same time, there is a process of evaluating the tool at each current moment of time, its approbation and the choice of the next stage of evolution in the event of the destruction of the previous or ineffective version of it. The task of the pedagogical process is the creation of an effective cognitive organization of a person, equipping him with universal tools for solving life problems.

Cognitive educational technologies can offer effective solutions that can significantly improve both the quality of information transmitted to students and offer them a system of tasks that ensure its deep processing. Particular attention should be paid to methods for obtaining feedback on the assimilation of the content of training, since any information exchange inevitably causes losses and distortions that have cognitive causes.

Cognitive schemes of the elements of scientific knowledge, formed in the minds of each student, should contain only their necessary and sufficient features.

The solution of this problem is complicated by the fact that most of the random features that are part of individual cognitive schemes and distort them are activated at the subconscious level, so their identification in the learning process is a serious problem.

To organize training based on the correction of cognitive distortion of information that occurs in the educational process, three cognitive educational technologies have been developed:

• cognitive learning technology (author M.E. Bershadsky [3]);

• associative link visualization technology based on the mind map method (author E. A. Bershadskaya [2]);

• a technology for visualizing semantic relations based on the method of concept maps (author M. E. Bershadsky [4]).

These technologies are subject-independent, that is, they can be used to study any content at any level of education, from kindergarten to adult education.

Consider visualization technologies based on the methods of mind maps and concept maps.

Both technologies allow the teacher to monitor in real time the processes of extracting information from the studied texts by students. This allows you to immediately determine the presence of cognitive distortions and correct them by offering students additional tasks. Thus, the teacher receives continuous feedback necessary to manage the cognitive process. Mind maps and concept maps are built using special computer programs, which makes them a convenient tool for implementing e-learning and mobile learning. Both methods make it possible to improve the cognitive competence of students, which is a priority in the modern conditions of the information society.

The method of mind maps is a powerful cognitive tool, the use of which allows you to dramatically increase the efficiency of the intellectual activity of each student:

• improve the skills of systematization and structuring of information;

• learn how to quickly process large amounts of information;

• increase the clarity, depth and accuracy of thinking by mastering generalized cognitive schemes for presenting various information;

• improve some types of operational and long-term memory (verbal, figurative, emotional);

• develop creative abilities;

• improve the skills associated with the generation of information (preparation of reports, writing articles, work planning, project implementation, etc.).

An increase in the information competence of students occurs when mastering computer programs for building mind maps, improving the skills of searching,

analyzing and selecting information on the Internet and presenting information in the form of hypertext.

Mastering the technology of visualizing associative links contributes to the development of communicative competence, since group forms of work are used in the process of training in advanced training courses. The practical work of students on the presentation of information in the form of mind maps goes through three stages. First, each listener draws his own mind map, displaying his vision of a certain topic in it. At the second stage, students are united into groups, each of which is tasked with creating a group map that combines individual maps of group members. To solve it, it is necessary to coordinate personal views and create a common product, which in the future will need to be presented to the audience, justify and defend your point of view during the discussion. At the third stage, a public defense of group work is organized, accompanied by a discussion and reflection of the results.

Increasing the level of professional competence of students is associated with improving the ability to organize and manage group activities of students in the study of new information, repetition, systematization and generalization of educational materials. In particular, students will learn:

• to design models of lessons of various types based on the technology of visualization of associative links;

• create expert mind maps for each type of information;

• develop diagnostic tools for differentiated evaluation of students' work;

• timely detect errors in maps built by students;

• develop criteria for evaluating students' work.

The practice of many years of application of the technology of visualization of associative links on experimental sites has shown that it contributes to:

• intellectual development of students;

• development of various types of memory;

• the formation of general educational skills related to the perception, processing and exchange of information (taking notes, annotating, participating in discussions, preparing reports, writing abstracts, articles, analytical reviews, conducting content analysis, etc.);

• formation of skills related to metacognitive control of one's own intellectual activity;

• formation of a system of subject knowledge and skills;

• formation of skills to recode information;

• increasing the speed and completeness of information processing;

• generalization and systematization of information;

• formation of communication skills necessary for effective interaction in a group.

A mind map is an adequate tool for presenting knowledge in the form of frames: the main theme of the map corresponds to the name of the frame; the first associations (first-order branches) can display the names of features, and the second-order branches - their values. This property of mind maps allows us to say that with their help it is possible to control the formation of a system of cognitive schemes in the mind of the student, adequately reflecting the properties and patterns of the surrounding world.

The technology of visualization of semantic relations in its structure, method of presenting information, methods of organizing the educational process is close to the technology of visualization of associative links discussed above, therefore everything that was written above about learning based on this technology equally applies to the technology of visualization of semantic relations. These technologies differ in the method of presenting information.

The technology of visualization of semantic relations is based on the method of concept maps, which is based on the idea of the structural organization of knowledge, which is a consequence of the theory of semantic networks that accumulate the entire set of information of an individual about the world around. The learning process using this technology is the development, refinement, systematization and generalization of students' cognitive schemes, which are displayed in the form of semantic networks of the studied areas of knowledge.

Cognitive learning technologies are based on the belief that the main source of learning problems is students' misunderstanding of the learning content, which occurs due to their lack of cognitive schemes necessary for the perception of scientific information. The training procedures of cognitive technologies are built on the assumption that the main means of combating cognitive distortion of information, which makes it possible to form cognitive schemes adequate to the studied content in the long-term memory of students, are tasks for multiple logical processing of the learning content [5]. They are presented to students at seminars or practical classes, trainings that are held in group form and are non-linear, i.e. different groups of students can perform different tasks depending on the previously shown results.

Thus, cognitive technologies ensure the unmistakable assimilation of the content of training and the improvement of the cognitive, informational, communicative and professional competence of students. Cognitive learning technologies can be applied to organize distance, electronic and mobile learning.

Having mastered cognitive educational technologies, the student receives powerful cognitive tools that increase the efficiency of intellectual activity.

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