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Theoretical Aspects of the Algorithms Use Problem for the Physical Tasks Solving in the Training Process

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Abstract: The article gives the detailed analysis of the "thinking" definition. Here there are all major conditions for solving the task of thinking development. Performance of mentioned conditions requires the constant control of the development thinking dynamics. The following thesis was put forward: “studied at school Physical Theory shall reflect the modern scientific way of thinking, as well its mastering shall ensure the formation of this way of thinking along with the assimilation of the knowledge amount". Were identified the major disadvantages in knowledge and skills of the secondary school graduates: an misunderstanding of the formulas being used, an inability to apply knowledge and skills in the changed and new situations, an inability to assess the reality of the obtained results, an inability to perform operations with numbers written in the standard form, the incompetence in the general educational skills formation (ability to analyze charts, figures, tabular data, etc.).

Key words: Analysis · Thinking · Problem solving · Thesis · Skills · Development · Knowledge · Logic

INTRODUCTION

At present, in light of the Concept for Modernization of education, in greater degree, the focus is on the thinking development, as a condition of identity formation meeting the requirements of the modern society. No matter how changed the social order of a comprehensive school, it has always had a requirement for the creative personality education. A person, who has opportunities to do this, confident in them and has certain terms and conditions to implement them, in the first place, the development of thinking that creates the prerequisites for a successful orientation in different areas and, above all, in the professional, can become such person. To 15-16 years most of students have already a formed focus on the future professional activity field. According to the sociological researches of the Ministry of Education and Science of the Republic of Kazakhstan "a professional self-determination of those people, who intend to continue their education in the University, mostly formed in the 9th grade. In this case, 70-75% of the students after ending of 9th grade were already defined in the selection of the possible field of professional activity”.

Our observations and experience show that the mechanism of mental activity gives the positive results in learning; it ensures the development of thinking and creates the opportunities for the creative mastering of knowledge. As any activity, as the development of thinking and creativity achieves an effective result in the implementation of the independent students work system. Among the most important conditions under which the independent work of students contributes to the development of thinking and the formation of a creative approach to solving the learning tasks, a special role is the realization of the problem-based learning by a teacher, which consists in the fact that the application of the various didactic materials and teaching methods by a teacher, provide that the students how to spontaneously have the need for self-education.

P.I. Pidkasisty elaborates on this idea in his studies, noting that “... students without special training and special education are unable to acquire knowledge independently. Indeed, in order to independently construct new knowledge, we need to know what we want to construct (definition, law, rule) and how to construct it. Therefore, in order to help students to acquire knowledge

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on a creative level on their own, they need to know the object of their cognitive activity and know how to work with it. And that they need to be specially trained. In other words, students should be taught the Cognitive activity and we need to give them the tutorial-cognitive apparatus" [1, 88-89].

The low level of knowledge of the majority of students, which does not always meet the governmental requirements to the minimum content and the level of subject preparation of the secondary school graduates, confirms the necessity to teach students the cognitive activity. Analysis of the overall results of a common national testing (CNT) on Physics in 2007 is indicative of the students' knowledge level of compliance with the requirements on Physics in the mass schools is extremely low. We can speak, only a small part of students is able to solve the physical and chemical tasks corresponding to a necessary minimum of knowledge and skills on Physics and Chemistry, respectively. Low level of knowledge is higher than a low level of thinking development.

Formation of scientific concepts in the study of Physics is solved from a position of the formation at students of generalized skills and methods of activity in the process of mastering the physical concepts. A number of works is devoted to the formation of physical concepts for the concrete objects, values and phenomena.

Positive emotions play an important role in improving the efficiency of mental activity, ensuring the management to find a problem solution [2, 224]. Consequently, one of the most important tasks that contribute to the development of students' thinking, when teaching Physics, is the task of forming a positive motivation.

Common to all the methodical researches is the emergence of the thesis that: “Physical Theory studied at School shall reflect the modern scientific way of thinking and its mastering shall ensure the formation of that way of thinking, along with the assimilation of the knowledge amount” [3].

M. Bershadsky argues that "the essence of the process of teaching physics consists in mastering the physical way of thinking by the students" [4,144]. Disclosing the meaning of the concept of "physical way of thinking," he points to the mutual connection of the logical and scientific-theoretical thinking. In the Philosophical Literature and the Learning Theory distinguish a formal and a dialectical logic. Analysis of the Methodological Literature shows that most scientists - Methodists physicists believe that the learning process shall be based on laws of the Dialectical logic. In the opinion of N.E. Vazheevskaya that assumes:

- Understanding the object is possible simultaneous has the opposite characteristics and it can operate with them;
- Understanding of the relationships and the interconditionality of phenomena and the ability to identify and analyze them;
- Understanding of the world nonstatic and the ability to treat the object or phenomenon in the development, constant motion;
- Understanding of the specificity of knowledge, the truth of his under certain conditions;
- Understanding of the interaction between qualitative and quantitative changes;
- Ability to see the manifestation of denial in the development of scientific knowledge.

It is obvious that to understand the laws of dialectical logic the formation of the mental activity techniques with students is required, that is thinking operations (analysis, synthesis, comparison, generalization, concretization and abstraction) used as a tool for the assimilation of knowledge. All those suggest the development of thinking.

The most effective ways of the students' dialectical thinking formation at Physics lessons are: use of tasks that contain the dialectical contradictions; analysis of relations between the physical quantities, causing the nature and direction of physical phenomena, analysis of depending the behavior physical phenomena or processes of various factors influencing it.

The studies of M.I. Makhmutov [5] and P.V. Popov [6] underline the necessary of interconnection between the dialectical logic and the formal (mathematical). As a subject of formal logic, the authors name the analysis of the existing knowledge structure. They consider a formal logical analysis as an important means of solving problems that fall within the scope of dialectical logic. In their opinion, "the dialectical logic differs from the formal in that it treats a question of the process of new knowledge occurrence itself and the process of the new concepts formation”.

The development of logical thinking eventually causes the development of a theoretical (dialectical) thinking that is directed "to the discovery of the laws and the objects properties". V.V. Multanovsky, describing the theoretical thinking, says, "in the phenomena, objects and connections of the material world is searched an important thing, stands out the essence, a genetic basis which is reflected in the "cell of knowledge"- the content abstraction or generalization, from the generalization the

specific findings are extracted, at that they are obtained, moving from general to the particular". Researching the theoretical thinking and the process of its formation, when teaching Physics in secondary school, A.V. Korzhuev defines, using the criteria of its formation at students, the ability to perform by them the following mental activities: modeling of the phenomenon under study, analysis of the conditions' role in its flow; nature reflexion of their own cognitive actions.

V.E. Pavlov points to an important feature of physical thinking - not only the ability to operate with the ideal science models, but also to correlate it to the reality as it is. However, he notes that "many abstract concepts are thought by students as the specific one". Therefore, according to the author - in order to develop the scientific worldview we shall pay greater attention to the semantic content of the basic Physics concepts [7, 18].

L.A. Ivanova identified the following levels of thinking development in the study of Physics: understanding, logical thinking and creative thinking. The highest level of development is the level of creativity, the characteristic feature of which is the problematic conception of learning. To achieve the specified level you need a well-developed logical thinking and a deep understanding of the material on Physics.

Consequently, all the above mentioned authors, speaking about the thinking in general, pay the special attention to the operations of thinking and to the mental activity that relates more to the thinking.

Thus, the successful study of Physics presupposes the existence of a certain system of the mental activity operations in the minds of pupils. However, the studies of a number of Methodists show that [8, 9, 10], the ability to use the mental operations for acquiring the knowledge is formed at the high school students not enough. This is indicated by the significant gaps in the knowledge of students which reflect the low level of understanding of the Physical material: students transform the physical objects into the quantities, perceive the connections between the concepts, as an identity of those concepts, are not aware of the concepts cause-and-effect relationships, memorize definitions mechanically, cannot obtain conclusions by their own. V.G. Razumovsky, Y.I. Dick and others emphasize that: "the success of our students is much higher when required a simple reproduction of educational material and lower, when is required to analyze by yourself the physical phenomenon, solve a problem or to do the laboratory research".

CONCLUSION

According to the results of study made in 2006, 2007 were revealed the main disadvantages in knowledge and skills of the secondary school graduates: misunderstanding of the formulas being used, the inability to apply knowledge and skills in the changed and new situations, the inability to assess the reality of the obtained results, the inability to perform operations with numbers written in the standard form, the incompetence in the general educational skills formation (ability to analyze charts, figures, tabular data, etc.). The results of mastering elements of scientific methods of knowledge and skills to apply their knowledge in the unfamiliar situations by students are still low. All these allows us to conclude that learning Physics must be carried out simultaneously with the formation of basic operations of thinking what, of course, will give students the methods of mental activity.

RESULTS

All abovementioned allows you to summarize that: Analysis of the research results on Physics in 2002 - 2004. and the experimental data given in the works of V. Guzeev, V.T. Razumovsky and Y.I. Dick, V. Guzeev, show us that the level of the students' thinking development is still low, the students do not realize the transfer of knowledge and methods of thinking activity in a variety learning situations.

For the successful solution of the development of thinking task you need the following conditions:

- Knowledge creation;
- Formation of the ability to apply the thinking operation in the study of Physics at students;
- Formation of learning to transfer knowledge and generalized methods of mental activity from one physical situation to another similar or distinctive.

Performance of mentioned conditions requires the constant control of the thinking development dynamics. As the criteria for determining the level of thinking development may be:

- Ability to apply the operations of mental activity in the assimilation and application of knowledge of physics in solving the specific problems;

- Students' scope of knowledge;
- Degree of manifestation by the students of their independence in the process of solving the learning tasks.

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