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METHODOLOGICAL FOUNDATIONS OF THE RESEARCH ON STUDENTS' DEVELOPMENT OF THINKING

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ABSTRACT

Philosophy examines thinking by means of theory of cognition, formal logic, studying forms and laws of the correct thinking, and by means of dialectics giving the general method of research of the logical thinking as a developing process.

Psychology studies the logical thinking as active activity of subject; exposes incentive reasons, aims, having the personal meaningfulness, individual features of the logical thinking; investigates cogitative operations from the point of view of realization by the subject of lying in their basis logical principles. Therefore, the psychological aspect of development of the logical thinking supposes purposeful activity in afore-named directions.

Keywords: mindset, ways of thinking, kinds of thinking, logical thinking, development of logical thinking, formation of mathematical thinking, methodological approaches for research of thinking, systematic approach to development of students' logical thinking, main components of logical thinking.

INTRODUCTION

One of the main things in the student's personality evolvement is development of their thinking.

To address this issue, on every level of the study (from social and pedagogical to methodical), it is necessary to have a conceptual framework, clearly marked initial positions.

Thereby, we first of all turn to philosophical analysis, since philosophy as a tool for analysis of pedagogy contribute to achieve success in both researching and practical work. This fact is widely corroborated by V.V.Krajewski [1], he considers the balance between philosophical analysis and pedagogical research. After the completion of the

analysis, his results become a heritage of pedagogical theory, its main part and a launching pad for the next theoretical work no longer in philosophy, but in pedagogics.

In terms of philosophy, thinking is "the highest form of reflection of objective reality, which is in purposive and generalized subject's understanding of significant links and relation between objects and phenomenon in artistic creation of new ideas and forecasting events and actions" [2].

Thinking is considered as product of historical development social practice and as a special form of human activity. In philosophy, psychology and pedagogy a distinction is made between the following forms of thinking: eye-mindedness, eye-active and verbal-logical thinking. Nevertheless, in philosophy forms of thinking are interpreted as "methods and types of formal organization of thought process, which are abstracted from its substantive component" [3]. If the substantive component is considered, then there are such types of thinking as theoretical and practical, theoretical and empirical, logical (analytical) and intuitive, realistic and autistic, productive and reproductive, involuntary and arbitrary. Logical thinking, also called discursive, implies logical progression from from one understanding to another, significantly different from intuitive, which discovers the world through contemplationand discretion without any evidence. In the framework of our study, we single out the logical thinking, but not reducing the significance of other listed types of thinking, which are important and interrelated in the actual process of thinking.

In the concise dictionary of system of psychological definitions, logical thinking is defined as a type of thinking, the gist of which lies in operation of notions, perceptions and inferences with the use of logical dictates [4].

This definition, in our opinion, does not take into account the ability to build your actions in accordance with logical dictates, that is why we think that N.A.Podgoretsky's definition is more constructive: "Ability to think logically includes several components: ability to focus on significant signs of objects and phenomenon, ability to obey the laws of logic, align operations in accordance with them, ability to produce logical operations, ability to speculate and withdraw consequences from these premises and etc." [5, *p.*25] .We will be guided by this definition

Let's take a short walk through the history: Until the end of 19th century, thinking, including the logical thinking, was seen primarily within logic and its characteristic features were interpreted in terms of this science, that is, logical and psychological aspects of thinking were not differed clearly. It was not until the end of 19th century, as a result of development of experimental psychology, the psychological and logical approaches to study thinking got separated.

Nowadays, logical thinking is studied by many sciences: philosophy, psychology, cybernetics, pedagogy, while also each of them study it in certain aspect, which is typical for each science.

Let's analyze philosophical, psychological, cybernetical and pedagogical aspects of studying the development of logical thinking.

Philosophy considers thinking using the learning theory, formal logic, which examines forms and laws of proper thinking, and by using dialectics, which gives general method of a research on logical thinking as a developing process [6].

Psychology studies logical thinking as vigorous activity of the unsub; reveals motives, goals, significant, individual features of logical thinking; explores thinking operations in terms of awareness of logical principles. That's why psychological aspect of development of logical thinking implies a determined effort in the above-mentioned areas.

Cybernetics is interested in logical thinking in connection with the tasks of technical modeling of mental operations in the form of "artificial intelligence", as well as those aspects of thinking that are associated with fast and efficient processing of information using computers. Thus, the cybernetic aspect of logical thinking development is conditioned, first of all, by the processes of mental operations modeling.

Pedagogy, as rightly noted by Getmanova [7], studies the logical thinking of the implementation of the process of knowledge in the course of training and education of the younger generation. Therefore, the pedagogical aspect of development of logical thinking of pupils consists in development and experimental check of necessary pedagogical conditions of the organization of process of training.

The varieties of logical thinking often include the so-called subject types of thinking: mathematical, physical, historical and others. This is due to the fact that only such mathematical, physical and other theoretical thinking can truly reflect their subject, which acts as logical thinking, because only in logical forms of thought can move in the content of things themselves, in their essential respects [8, *p.*339].

Subject types of thinking are investigated by methodologists of the corresponding subjects. N. P.Erastov, A. V. Efimov, Yu. M. Kolyagin, V. T. Kudryavtsev, A. Z. Redko, I. S. Yakimanskaya emphasize the importance of the development of logical thinking, suggest typical mistakes made by students, consider classes that are undergoing the development of students ' thinking, recommend to use special techniques. However, the very concept of "development of logical thinking" is usually not defined or sometimes defined too broad or, conversely, too narrow. Here are definitions of some of the authors discussed in the work of N. N. Pospelova, I. N. Pospelova [9, *p.*11–12].

"The development of logical thinking in the teaching of history is a transition from visual - logical thinking to verbal-logical thinking" (A.V. Efimov, A. Z. Red'ko). We agree with N. N. Pospelovand I. N. Pospelov that this definition cannot be used as a source for the development of thinking. The question arises: what exactly needs to be changed in order to move from one type of thinking to another?

"The development of technical thinking is the development of basic mental operations and techniques: consideration of objects from different points of view, rethinking, comparing" (T. V. Kudryavtsev, I. S. Yakimanskaya). The definition clearly fixes the specifics of technical thinking, but narrows the concept under consideration.

"The development of logical thinking in teaching geometry is the development of the ability to compare relationships, define concepts, generalize by induction, to reason deductively" (V. N. Rudenko). This definition gives a complete list of necessary skills,

but it reduces the development of logical thinking only to the listed skills, underestimates the laws of logic.

"The formation of mathematical thinking is a purposeful and systematic development of all the qualities inherent in scientific thinking, the mental skills that underlie scientific knowledge, in unity with the forms of manifestation of thinking, due to the specifics of the mathematics itself, with an emphasis on the gradual development of scientific and theoretical thinking" (M. Kolyagin). This definition emphasizes the inextricable link between natural science and mathematical thinking, however, the use of this definition in practice is difficult.

N.N.Erastov under the development of linguistic thinking means "the development of a system of mental actions to understand the different language meanings and the establishment of relations between them, and through them – the objective relationship of cognizable phenomena of reality" [10, p.11]. As you can see, this definition indicates the relationship of thinking with the object of knowledge (language values and structure), the features of mental operations, depending on the object of knowledge, but the definition is vague: it is not specified what kind of relationship is established.

By analyzing the above definitions, we agree with the definition given by H. N.Pospelov and I. N. Pospelov :" the development of logical thinking of students is arming their knowledge of the requirements of logic and development of skills to use these requirements in educational and practical activities" [9, p.14-15]

Different authors approach the analysis of the essence and content of thinking in General and logical thinking in particular from different points of view.

The study of philosophical literature on the problems of thinking leads to the conclusion that the differences in the views of the authors are generated by different methodological approaches to the study of thinking.

In modern science, it is becoming the norm that complex theoretical constructions are preceded by a thorough description of the methods used. The role of the method in scientific research is extremely large, the fate of the study often depends on the correct choice of the method.

According to the philosopher M. K. Mamardashvili, the concept of" method of consideration " (i.e. method of thinking) does not grow directly from the methods of thinking developed by the research practice of private Sciences, but is a special subject, the task of philosophical research [11, p. 5-6].

The Central place in materialistic dialectics is occupied by the method of ascent from the abstract to the concrete, as it "represents the most developed, integral logical structure, contributing to the comprehensive theoretical analysis of the studied objects" [12,p.8].

The movement of knowledge from the sensually concrete through the abstract to the concrete in thought is the general law of the development of theoretical knowledge.

However, this method only sets the General direction of theoretical research. The method fully realizes its possibilities only in unity with other methods of cognition.

So, from the point of view of the methodology of the activity approach, the philosophers of A.A.Batalov, G.S.Batishchev, L.P.Bueva, E.V.Ilyenkov and others explore the thinking.

The introduction of the category of activity in psychology radically changed the approach to the study of the psyche, in particular, made it possible to reveal the true causes of the development of thinking, to explore the mechanisms of its formation. Implementation of this principle, provided by the work of L. Vygotsky, S. N. Leontief, S. L. Rubinstein, etc., made it possible to understand the sources of different types of thinking, their functions in the knowledge and transformation of reality.

Being a generalized and indirect reflection of reality, thinking is aimed at analyzing qualitatively different aspects of this reality. The content of thinking is determined by the orientation, selectivity of cognitive activity of a person, his needs and motives in the implementation of activities dictated by social conditions.

The existing division of labouringly society leaves its mark on the character of thinking. People work in different fields, deal with different objects that they study, transform, and create. It is the sphere of human activity that determines the content of individual thinking, specializing it, directing it to the analysis of certain aspects of reality, the most essential for the productive implementation of this activity.

Features of the application of activity approach in solving actual educational problems found its further development in works of A. K. Abulkhanova-Slavski, P. Ya. Galperin, B. F. Lomov, A. V. Petrovsky, N. F.Talyzina, G. I. Schukina, D. B. Elkonin and many other scientists. Reliance on the methodological principle of activity allows to enrich the real pedagogical process.

The theory of activity allows you to: a) predict the structure of activities that are possible for each stage of future development, each time assuming that some of the existing laws and mechanisms of development will remain unchanged; b) to compare the states thus set with those that people need (in terms of achieving certain ideals); c) to identify the nature of the impact on the structure of activities that need to be made, based on this state of activity, to achieve ideals.

Pedagogical researches show that reserves of increase of efficiency of pedagogical process should be looked for in inclusion in it of various kinds of activity of school students and realization of interrelations between them. This increases the content of their activities, identifies and implements the potential of students.

With regard to the development of logical thinking of adolescent students of particular interest is the psychological and pedagogical analysis of the teacher and students at different stages of training.

The analysis of the structure of activity, its completeness helps to adopt the best practices of the teacher, and also helps to see what is the cause of failures: in the motivation for the activity or in its methods, in the lack of knowledge or in the psychological barrier that arises between the teacher and students. It is impossible to reveal the true nature and value of the teacher's experience outside the activity.

The implementation of the methodological principle of activity allows to change the nature of activity of schoolchildren from the lowest, reproductive level to the highest – creative.

Activity approach, which involves the identification of the structure of activity, led to the development of theoretical and experimental modeling method [13] which is used to build a model of activity of interest, which is then tested experimentally.

CONCLUSION

The system approach is based on the proposition that the specifics of a complex system object is not exhausted by the peculiarities of its constituent elements, but is associated primarily with the nature of the interactions between the elements. Therefore, the task of understanding the nature and mechanism of these relations and relations is coming to the fore. In the process of system analysis, it turns out not only the causes of phenomena, but also the reverse effect of the result on the causes that gave rise to it.

At the same time, as noted in recent philosophical studies, "the development of integrity is carried out:

- the formation of the ability of each element to perform a function in the interests of the development of the system as a whole;
- the emergence of new qualities that individual elements do not possess;
- in the process of the emergence of informative new elements for the fuller fulfillment of functions by other elements and the system as a whole "[14].

In our opinion, the systems approach is productive when considering the development of the logical thinking of adolescent students, since logical thinking belongs to the so-called non-linear systems.

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