

THE CONCEPT OF INTEGRATION IN THE APPROACH TO MATHEMATICS

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Abstract. *In philosophical literature, integration is interpreted as a side of the development process associated with the unification of previously heterogeneous parts and elements into a whole. Sometimes integration is understood as integration, that is, some result of the integration process, a state of orderly functioning of parts of the whole. It is based on human-cognized connections between various knowledge systems, which in turn are conditioned by the existence of mutual dependence and interdependence of objects and phenomena of objective reality.*

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As the most characteristic manifestations of the unity and diversity of the material world, possible moments are distinguished: commonality, properties and composition of heterogeneous objects, similarity in the structure of various qualitatively

the presence, the presence of processes of mutual transformation of some material formations, some conversions into others; common origin, genetic unity of various objects. The identification of significant features, manifestations of the unity of the diversity of matters allows the world to more strictly and clearly recognize the objective foundations of the processes and differentiation of scientific knowledge. Revealing the essence and features of objective processes in the scientific field of cognition, philosophy and natural scientists highlight the increased development of their processes, developing a typology of synthesizing (synthetic) processes, increasing for most sciences. knowledge.

According to many philosophers, the study of precisely these transitional areas was of exceptional interest both for clarifying (clarifying) the connection between the sciences and for understanding the nature of each individual area of human knowledge. And it was here that the greatest results were to be expected.

Thus, the principle of development underlying the new concept directs the attention of researchers to points of contact between the sciences, which was either not noticed or ignored before. It was necessary to sharply raise the level of scientific training of teachers, to create conditions for familiarization with the latest scientific achievements. The idea was put forward of annual short-term courses for teachers of physics, chemistry and cosmography to replenish and update information from the field of physical and chemical sciences. With regard to the content of the disciplines themselves, a line was drawn, on the one hand, to clarify the nature of each discipline, on the other hand, to establish the necessary connections between subjects.

The same trend is revealed in the approach to mathematics: The purpose of studying mathematics is to master it as a science and a scientific method of world knowledge. When teaching mathematics, it is necessary as often and as practical as possible to bring it (especially in tasks) closer, as a scientific method of understanding the world, to those specific scientific facts and phenomena to which it is applicable. Borrowing phenomena suitable for this purpose from various sciences (geography, statistics, physics, mechanics, astronomy, etc.), it is necessary to clothe questions about these phenomena in the form of simple and scientifically expressed mathematical problems.

The new school was born in the course of an acute theoretical struggle in the field of pedagogy, in natural science and philosophy. This was reflected in the formulation of new didactic tasks and requirements, in the definition of the new content of education, the new structure of academic disciplines, as well as in the development of the pedagogical theory of the new school, in particular in the development and implementation of new principles of pedagogy and among them the principle of unity and integrity of scientific knowledge. Consequently, the attention of the pedagogical community to the problem of interdisciplinary connections arose, first of all, in connection with fundamental changes in science, mainly in natural science and philosophy.

Young sciences appear and rapidly develop (bionics, chemical physics, biogeochemistry, geophysics, mathematical physics, etc.), "spun off" from fundamental or born from the merger of individual areas, and sometimes several related disciplines. These phenomena testified to the turbulent processes that took place in the field of scientific knowledge. During this period, research continued on the phenomena of radioactivity, the structure of the atom and its nucleus, and nuclear reactions. Atomic weapons are being created, nuclear power plants are being put into operation.

The sharply increased authority of science both as a source of new impulses for the development of society and as a means of their implementation led to the fact that it itself found itself at the center of numerous studies deployed both in terms of the history of science and in terms of theoretical understanding and forecasting of the fundamental processes of the development of scientific research. Special attention of researchers was attracted by the processes of differentiation and integration of knowledge. Integration and differentiation correspond to two tendencies of human cognition: on the one hand, to represent the world as a whole, on the other hand, to comprehend the patterns and qualitative originality of various structures and systems more deeply and more specifically.

These two trends dialectically condition and complement each other. At the same time, a number of works emphasize that the ratio of the processes of integration and differentiation is not invariable, immovable. At various stages of the development of scientific knowledge, one of these processes may dominate. In connection with the increased attention to the processes of synthesis, the study of the essential aspects of the source of all human knowledge, the material world, has intensified. The possibility of performing the processes of differentiation and integration of knowledge is rooted in the unity of the diversity of the material world. "The unity of the diversity of the world around us is the objective basis for the processes of differentiation of sciences, specialization of knowledge, on the one hand, and the processes of unification, interconnection of sciences, integration of knowledge, on the other.

The essence of the integration of sciences and scientific knowledge (in the philosophical understanding of this problem) is presented as their ever-increasing interconnection, interaction through the widespread use of common ideas, means, techniques, etc. studies of the surrounding reality, as a consolidation (condensation) of knowledge in definitely established and constantly improving forms of cognition and expression of the known.

These moments, characteristic of the integration of sciences and scientific knowledge, also affect the forms of expression, or manifestation, integration of sciences and synthesis of knowledge. The integration of sciences is consolidated in the formation of "bridge" and synthetic sciences, in the formation of various complexes of interconnected and intertwined sciences, in the creation of a single system of sciences. The synthesis of knowledge finds its expression in the development of more general concepts, theories, concepts, in the construction of local (physical, biological, etc.) pictures of the world, in the creation (in the future) of a general scientific picture of nature, a general theory of science. The

activity approach allows the result of science and the components corresponding to this approach to be presented as only one component, an aspect of the "activity" concept of science, which includes other aspects and components. The application of the activity approach allows, along with the subject and object of cognition, to identify other real-life components, to identify the dependence of the inclusion of components on the aspect of consideration.

The relationship between the methods and techniques of various sciences is determined by the complexity of the problems that arise. In the case of social phenomena, a comprehensive, qualitative and quantitative analysis is one of the foundations of a holistic approach to society as a single object and, thus, its comprehensive knowledge. In general, the close interaction of sciences in the process of studying various objects (subjects) is determined by a number of factors: the natural nature of the processes occurring in nature and society at various levels;

-social practice, putting forward more and more complex tasks that require the combined efforts of the sciences for their solution;

- the very logic of the development of science, which objectively leads to closer contacts between the sciences, to the synthesis of scientific knowledge. At the present stage of the development of world civilization, the expression of the differentiation of scientific knowledge is also qualitatively changing. If earlier new sciences arose mainly due to the process of differentiation of knowledge, now they arise to the greatest extent due to the process of its integration. Penetration into the nature and content of the contradictions between the unity of the material world and its differentiation allowed scientists to discover a new - integrating - function of the differentiation of science. The integration of sciences and scientific knowledge, carried out on the basis of differentiation, occurs on the basis of the laws of dialectics, in particular, the law of unity and struggle of opposites. The movement of knowledge goes from the higher (through differentiation) to the lower, and then from the lower (through integration) to the higher.

The forms of action of the mechanism of integration of sciences and scientific knowledge are different. Separate processes:

- "internal" synthesis (interpenetration of directions that occurs in each individual science);
- "external" synthesis (relationship, unity between branches of knowledge that make up complexes that are part of an integral system of science);
- "vertical" synthesis (integrating the impact of sciences from more general, theoretical ones - mathematics, cybernetics - to "median", connecting - natural and social - and then to applied, technical, directly related to production);
- "horizontal" synthesis (the connection of scientific branches within large complexes of sciences that have long been established - natural, social, technical).

The inevitability of differentiation and integration of sciences for the first time theoretically substantiated and predicted by F. Engels. He pointed out the objective basis for the integration of sciences - the unity of the diversity of nature, due to which all objects, processes, phenomena are interconnected and interdependent.

The processes of differentiation and integration of sciences and scientific knowledge are increasingly considered as an objective pattern of the development of science. Wherein integration is considered the leading one at the present stage.

The differentiation of scientific knowledge in modern conditions has acquired a new function - an integrating one. It acts as a form of manifestation of integration, and integration forms the basis for further deepening

differentiation of disciplines. Differentiation and integration influence the process of cognition. The movement of knowledge goes from the higher (through differentiation) to the lower, and then from the lower (through integration) to the higher. The integration of sciences leads to the intensification of scientific activity, so

how new results arise not due to the involvement of additional funds and other elements of scientific activity, but due to interaction

sciences, the emergence as a result of this of new systemic effects, new qualities. In classical pedagogy, integration acted in the form of complexity and in the form of interdisciplinary connections. In the 80s. 20th century integration into

Pedagogy was understood as the process and result of creating an inextricably linked, unified, whole and was reduced mainly to the concept of an integrated course.

Such a definition did not indicate the method of integration, therefore, subsequently, the integration of education is defined as the implementation by the student under the guidance of a teacher of consecutive translation of messages from one educational language to another. In theoretical pedagogy, integration is seen as a more complex form of communication and is defined as the essence of education. The peculiarity of integration as a way of working with information, knowledge, is that it ensures the development of the learning consciousness. The educational system built on an integral basis belongs to the educational systems of the developing type.

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