

Argiropoulos D., Voznyuk O. (2025) Creative integration of knowledge is the problem of modern pedagogy and education. *Creative Pedagogics: Scientific Journal*. Zhytomyr, 18, 9-15.

UDC 371.2 (09)

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CREATIVE INTEGRATION OF KNOWLEDGE IS THE PROBLEM OF MODERN PEDAGOGY AND EDUCATION

Аналізується актуальна проблема організації знань у системі професійно-педагогічної освіти у контексті розробки системи інтегративних знань та міжпредметних лекційних курсів. Окреслюється інтегративний підхід до організації інформації у сфері освіти, який допомагає сформувати у студентів вміння комплексного застосування знань, їх синтезу, коли перенесення ідей і методів з однієї науки в іншу лежить в основі творчого підходу в сучасних умовах науково-технічного прогресу.

Ключові слова: *інтеграція знань, професійно-педагогічна освіта, інтегративний підхід, природничі, гуманітарні, фундаментальні, прикладні науки, природознавство.*

The current problem of organizing knowledge in the system of professional and pedagogical education is analyzed in the context of developing a system of integrative knowledge and interdisciplinary lecture courses. An integrative approach to organizing information in the field of education is being outlined, which helps students form a comprehensive set of knowledge, their synthesis, when transferring ideas and methods from between the sciences also form the basis of a creative approach in modern conditions of scientific and technological progress.

Key words: *integration of knowledge, professional and pedagogical awareness, integrative approach, natural sciences, humanities, fundamental, applied sciences, natural sciences.*

Introduction.

The development of modern pedagogical science is characterized by the search for fundamental approaches to building the educational process, which is reflected in the educational documents of Ukraine, stating that the goal of education process should be a professionally competent, proactive, creative citizen, endowed with a sense of duty and responsibility to society, able to quickly adapt to the modern world, the characteristic features of which are the increase in the role of the personality, the intellectualization of its activities in the context of rapid changes in technology and engineering, continuous exponential growth in the volume of information and the renewal of knowledge, constant expansion and deepening of the spheres of scientific research. The intensification of information flows, as one of the main factors of the globalized world entering the era of the information society, reflects the crisis of the classical scientific paradigm, which is manifested in the spread of two opposing trends in modern science – universalization and integration of knowledge on the one hand, and their scientific and

technical specialization – on the other.

Against the background of these trends, the crisis of the modern education system is revealed, which, according to S.U. Goncharenko, is a component of the global civilizational crisis and is largely due to the narrowly disciplinary orientations of modern education, its alienation from humanitarian and natural science components. The consequence of this is "the fragmentation of a person's vision of reality, which in the conditions of the birth of a post-industrial information society does not allow people to adequately respond to the aggravation of the energy and environmental crisis, the devaluation of moral norms and spiritual values, the kaleidoscopic change technologies, the instability of the political and economic situation. Today, under the avalanche of information, we suffer from the inability to grasp the complexity of problems, to understand the connections and interaction between things in different spheres of our segmented consciousness" [2, p. 3].

The purpose of the article.

Therefore, we can talk about the extreme relevance of the problem of organizing knowledge in the system of professional and pedagogical education. In general, the analysis of the problems of development of a system of integrative knowledge in the educational sphere, in particular in the sphere of professional and pedagogical training, is the purpose of the article.

Presentation of the material.

In educational institutions, along with traditional texts and visual material, the new forms of presenting knowledge should be introduced, which in turn necessitates the search for means of presenting them in the didactic process and methods for processing information – educational and cognitive operations, methods of learning and teaching, since even information of the same content can be embodied in a variety of forms.

One of the innovative directions of the aforementioned research is implemented in scientific integration, which can be called the process of interpenetration, consolidation, and unification of knowledge, which is objectively determined by the interpenetration of various types and components of material- productive, and socio-political activities of people and is based on the philosophical principle of the unity of the world, the universal connection of its objects and phenomena.

It is significant that the term "integration" was practically not used until the 19th century. At the turn of the 19th and 20th centuries, a process of "cementation of sciences" took place, the formation of interdisciplinary connections between previously scattered scientific fields, and new interdisciplinary areas of research appeared. In the 20th century, philosophers tried to create a single unified science, using the apparatus of mathematical logic as a means of analysis, where the principle of reductionism had a significant influence on the idea of integration. This led to the conclusion that the whole should be considered as a supersummative, superadditive unity, and the task of integral logic is the synthesis of the whole based on ideas about the properties of its parts. Here we can also talk about organicism as a way of integrating knowledge, characterized by the unification of different parts to increase the integrity of the whole by establishing relationships with other parts or knowledge in this whole.

As V.R. Ilchenko writes, an integrative approach in education is an approach that leads to the integration of the content of education, that is, the purposeful combination of its elements into a whole. At the same time, the result of the mentioned integrative approach can be holistic systems of knowledge of different levels – the integrity of knowledge about social (including pedagogical), natural, cosmoplanetary reality. It is important that in the practical plane, the integrative approach is implemented during the study of integrated courses or separate subjects in the educational field, when the integrity of knowledge is formed due to their integration on the basis of concepts common to all subjects, the application of methods and forms of learning, control and correction of educational achievements of students, which direct the educational process to the unification of knowledge. This occurs on the basis of interdisciplinary approaches to their organization.

The historical aspect of the development of the problem of integration of knowledge in pedagogy is important. J.G. Pestalozzi proposed the idea of a labor school, in which he combined practical and theoretical training; J.-J. Rousseau believed that a comprehensively developed person will necessarily find an activity corresponding to his/her natural inclinations and master it; J. Herbart substantiated the psychological aspect of the relationship of knowledge, on the basis of which he came to the conclusion that under the condition of connected teaching of the material, students acquire skills faster and more fully than with isolated study of subjects. At the same time, J. Herbart attached great importance to the coherence, systematicity of knowledge. The need for the relationship of knowledge was also indicated by A. Disterweg, who believed that each subject requires to reach an understanding of all sciences.

K.D. Ushinsky gave a deep psychological and pedagogical justification of the ideological role of interdisciplinary connections when he considered the structure of science. This allowed him to show that in addition to special concepts that belong to each science, there are concepts that are common to many, and some to all sciences. The level of integration of knowledge in science becomes a sign of its maturity, the result of the internal laws of its development.

In the 70s-80s of the 20th century, there was a discussion about an integrative approach to the organization of sciences and students' worldview. In the 90s of the 20th century, integration began to be considered as a didactic principle. It should be noted that in domestic pedagogy, on the basis of an integrative approach, the concept of a holistic natural science education, theoretical and methodological principles of forming the content of the educational branch "Natural Science", a system of educational and methodological kits for it (programs, textbooks, manuals for students, teachers) have been grounded. The theoretical and methodological foundations of integration, their implementation in the content and educational process of professional education have been worked out. The following directions can be distinguished, in which subject areas are combined:

- 1) close natural sciences and humanities (mathematics, languages, history);
- 2) various natural sciences;
- 3) theoretical (fundamental) and applied sciences;
- 4) the natural sciences with the humanities;
- 5) the natural and social sciences;
- 6) foreign languages and their cultural environment.

Thus, integration in education performs the following functions: educational, upbringing, developmental, psychological, methodological, organizational. At the same time, integration can have different forms: subject-figurative, conceptual, worldview, activity, conceptual, etc.

In pedagogy, philosophy of education, various types of integration and, accordingly, integrative approaches are considered: essential, holistic, polycentric, philosophical, technological, personality-oriented integration; various submechanisms of integration are used: law, metaphysics, network of theories, picture of the world, etc.

In Ukraine, the problems of an integrative approach in education are solved by scientists from Kyiv, Lviv, Poltava, Lutsk, Ternopil, and Dnipro. We can talk about the scientific and methodological center for the integration of educational content in Poltava. These institutions develop philosophical, psychological, and didactic foundations for the integration of educational content in preschool, primary, secondary, and high schools, and determine the impact of holistic education on the health of students, the development of verbal and nonverbal intelligence, and on motivation for learning and the formation of students' social maturity.

In the USA, the integrative approach is being developed at the California University of Integrative Studies. The University of Maryland (Baltimore County) subsidizes the ESIP (Elementary Science Integration Project), aimed at studying the integration of science. In Ohio, the Association for Integrative Studies (AIS) operates with the aim to exchange ideas among scientists and administrators in all branches of science and art on problems related to integrative studies. In Paris, the International Center for Transdisciplinary Research operates, the goal of

which is to establish the nature and characteristics of information flows circulating between different branches of knowledge.

Therefore, according to V.R. Ilchenko, the desire for integration in education is a general social-cultural trend [4, p. 356]. The term "integration", which means "unification, connection, summarization", is used in pedagogical technologies in several meanings. From a philosophical and pedagogical points of view, integration can be considered as a mechanism that ensures the alignment of the individual level of thinking and the level of development of the collective consciousness of humanity, which is defined by the concept of "noosphere". This is also a concept that reflects the fundamental conditions of the structure of any system.

The essence of the principle of pedagogical integration (which is leading in the development of modern educational systems) lies in understanding the relativity of strict differentiation of natural and humanitarian knowledge into separate educational branches, the desire to create synthetic, integrated systems of knowledge that give the participants in educational process an idea of a holistic picture of the world.

At the same time, we can talk about the concept of integration in education, which is based on the following theoretical and methodological foundations:

The principle of complementarity of the natural scientific methodological tradition and humanitarian methods of cognition.

Synergetic approach: commonality of laws and principles of self-organization of various macrosystems – physical, chemical, biological, technical, economic, social.

Systemic approach: integration is a system of systems, the result of a higher-order systematization.

Epistemological approach: integration is a method and process of forming a multidimensional polyphonic picture of the world, based on a combination of different methods and forms of comprehending reality; it is also the process and result of the formation of integrity (holism) – a single quality based on many other qualities; the principle of implementing the educational process, based on mutual complementarity of various forms of cognition and mastering of reality.

Hermeneutic approach: integration is a principle that manifests itself in the transformation of all components of the educational system in the direction of unification, generalization, development of integration educational programs, training courses, lessons, events, obtaining integration educational results, etc.

Activity approach: integration is a means that ensures a holistic knowledge of the world and person's ability to think systematically when solving practical problems; creating conditions for the formation of a personality and multidimensional picture of the world and self-knowledge in this world in students.

Information approach: integration is the leading trend in updating the content of education, being a major scientific problem. The main task here is to integrate the channels of information interaction of pupils and students with the world in its integrity and diversity, to actualize the natural possibilities of multidimensional perception of reality. The objects of integration in educational cognition can be: types of knowledge, a system of scientific concepts; laws, theories, ideas; models of objective processes.

Developmental learning: from the standpoint of personality development, integration creates conditions for reaching a higher level of understanding of being; improving the individual-personal apparatus of cognition; developing freedom of thinking; forming students' creativity and critical thinking.

In this case, from the synergetic point of view integration can be understood as the process and result of the interaction of elements (with given properties), which is accompanied by the restoration, establishment, complication and strengthening of essential connections between these elements on the basis of sufficient grounds, as a result of which an integrated object (system) is formed with qualitatively new properties, in the structure of which the individual properties of the original elements are preserved [3, p. 376].

The set of theoretical provisions that explain the essence of the phenomenon of integration in modern pedagogy are united by the general concept of "integrative approach": as a result of integration, previously independent elements are combined and in a certain way synthesized into a holistic system based on the establishment of functional relationships, mutual transition and complementation, management, convergence of theories of teaching and upbringing, unification in systems of organizing education and its content.

In general, the problems of an integrated approach in education are studied in modern pedagogical theory and practice in the following areas:

- methodological problems of integration;
- the use of an integrative-differentiated approach to structuring the content of knowledge and education, reducing multi-subjectivity, consolidation of educational branches;
- generalization of the content of educational subjects;
- formation of a knowledge system by integrative methods;
- combination in the same spatial-temporal coordinates of different technologies, methods, techniques;
- integrating the didactic units;
- integration of the content of vocational/professional education;
- features of integrative processes in vocational and technical school;
- interrelationships of integration and differentiation;
- structuring of integrated knowledge and integrity of the content of natural science education;
- problems of developing integrated courses;
- technologies of integrating educational subjects (for example, physics + chemistry);
- integration in graduate and post-graduate education;
- probabilistic and statistical aspects of integration;
- integration of control elements in teaching;
- integration in theoretical and industrial training;
- integrative learning using computer technology in vocational training;
- formation of didactic complexes in vocational and technical education by integrative means;
- integration of general technical and humanitarian knowledge;
- environmental education; global, holistic, integral education;
- civic education;
- combining upbringing and teaching, teaching and work, the efforts of the school and the community into a single whole [1].

It should be noted that integration can be considered as an important lever for optimizing the final result of professional training, as a condition, a means of increasing the efficiency and reducing the terms of mastering the basics of professional skills by future specialists; as a process or state of reconstruction, restoration, replenishment, combination of previously isolated parts, as the creation of large pedagogical units based on the interconnection of various components of the educational process.

The main methods of integration include: unification, universalization, categorical synthesis, extrapolation, generalization, modeling, systematization.

Integration is associated with qualitative and quantitative transformations of interacting elements.

Thus, the theoretical provisions of the pedagogical integration become a function and method of pedagogical cognition, a tool for transforming psychological and pedagogical practice.

As methodological knowledge, the pedagogical integration is able to ensure the continuity of traditional and new, theoretical knowledge and practical experience.

As a tool for transforming practice, the pedagogical integration is able to eliminate duplication, i.e. optimize the pedagogical process, leading to the creation of new theoretical and

practical objects, such as concepts, theories, pedagogical systems, new training courses, types of activities that change the environment, create new models, technologies, didactic tools.

In general, integration is a necessary condition for the modernization/perfection of the content of education, contributes to the formation of a holistic system of knowledge, skills and abilities in students, the development of their thinking, creative faculties.

Integration, which as a general scientific principle is increasingly used in the construction of pedagogical reality, involves taking into account the diversity of features of the elements that are integrated, and in the process of accumulating quantitative features and the emergence of a new quality, the individual features of the integrated elements are preserved (the principle of unity, quality and quantity).

We can also talk about the main philosophical concepts of knowledge integration:

- the concept of the unity of the world;
- the principle of the universal connection of world phenomena;
- the concept of knowledge integration as a manifestation of creativity in human activity.

Thus, we can talk about metasubject integration as a way of forming the content of education (I.M. Kozlovskaya), which actualizes the new didactic concept – "metasubject", the content of which is based on the system of fundamental educational subjects [5].

All this requires the implementation of the current task of preserving the learners's integral perception of reality through the use of integrated lessons and courses that reveal a qualitatively new level of synthesis of children's knowledge and unite separate knowledge within a certain lesson or topic. Therefore, the synthesis of this knowledge allows to achieve a multifaceted consideration of the object, to show the interrelation of phenomena, to intensively form in the student the mental operations of analysis, comparison, generalization, etc.

At the same time, this is especially important for the development of person's worldview, anthropological, ecological, communicative skills, concepts. In addition, integrative knowledge is much easier for students to apply in new situations, since the integrative approach itself from the very beginning prepares students for going beyond the framework of ordinary situations (G.Ya. Dutka).

Thus, the integrative approach presupposes the formation of the ability to comprehensively apply knowledge, their synthesis, when the transfer of ideas and methods from one science to another lies at the heart of the creative approach to scientific, engineering, artistic activity of a person in modern conditions of scientific and technological progress [6, p. 8].

Conclusions.

Integration of knowledge proves its expediency, and such aspects of the organization of scientific knowledge as regularity, necessity and randomness in the context of the use of integrated knowledge are expressed more logically and fully [5]. Therefore, integration of knowledge contributes to its completeness: the same amount of integrated knowledge is didactically more complete than subject knowledge. With this approach, knowledge acquires efficiency and mobility as a readiness to apply it in similar and variable situations, which contributes to more effective mastery of the methods of its application. Integrative knowledge is much easier and more creatively implemented by students in new situations, since the integrative approach itself from the very beginning prepares all participants in the educational process for going beyond ordinary situations [3]. Therefore, the integrative approach is the basis of creative activity, since it involves the students' ability to comprehensively apply knowledge, synthesize it, transfer ideas and methods from one science to another.

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