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**THE CONCEPTION OF THE INTEGRATION OF AXIOLOGICAL AND SYSTEM APPROACHES TO THE DEVELOPMENT OF ECOLOGICAL AND HUMANISTIC VALUES IN THE PROCESS OF SECONDARY SCHOOL CHEMISTRY EDUCATION**

In the field of education, the term “axiological approach” means the orientation of the pedagogical process on mastering core social values by students, recasting them to personal value orientations. M. Kuz'minov notes that different elements of value orientations are, on the one hand, “the stages that individuals go through when building the awareness of the value systems external to them; under the influence of a number of factors, these external value systems are transformed into a system of the intrapersonal social orientations. On the other hand, they reflect the structural hierarchical nature of the system of values that surrounds the personality [1, p. 109]. Therefore, as a theoretical model that offers its own way of modernizing school education according to the requirements of the modern society, the axiological approach can be successfully implemented only if *integrated* with the leading ideas of other contemporary methodological approaches, particularly a systems approach.

The integration of axiological and systems approaches is being implemented widely into the modern pedagogical practice. Furthermore, V. Klyopikov uses axiological integration as the education technology of ethical educational interventions [2]. A. Volkov, N. Dvulychans'ka, S. Matakova, and H. Fadeyev view the systems and axiological approach as a new paradigm of a life-long competency-based chemistry education “secondary school – professional/vocational college – university” [3]. However, for the purposes of the formation of ecological and humanistic values in schoolchildren, the integration of these approaches has not been applied in the context of the humanization of the chemical education, and, in this regard, our study seems important and relevant, whereas the development of the conceptual framework of this integration is the goal of the article.

The implementation of the integration of axiological and systems approaches to the formation of ecological and humanistic values in the secondary school chemistry education requires, in the first place, the clarification of the notion “integration” as applied to education, as well as its importance for and impact on the teaching process. This agenda testifies to the desire to develop a modern personality in possession of a systems thinking, capable of the conscious analysis of its own activity, able to act independently in the face of ambiguity, as well as to acquire new knowledge and skills based on the formed values.

Thus, integration (from Lat. *integrātiō* – “restoration”, “renewal” and Lat. *integer* – “whole”) is a facet of the process of development that brings together originally heterogeneous parts and components. The processes of integration can take place both in existing systems (in this case, it enhances the integrity and organization of these systems) and in the systems emerging on the basis of previously unrelated elements [4, p. 215]. This is clearly illustrated by the main stages of integration processes: objective preconditions → individual components → combining mechanism → establishment of inter-component links → emergence of a conglomerate → synthesis of a new formation [5]. It should be emphasized that integration is not just a reproduction of the integrity and compartmentalization of the objects of cognition or strengthening of ties. It is a change in the source elements. If this change does not occur, nor does the strengthening of ties, and, as a result, the elements are united mechanically. Integration process means the formation of a new whole, which possesses the systems qualities of the general scientific, inter-scientific, and intra-scientific interaction, appropriate mechanisms of interconnection, as well as changes in the elements, functions of the object of study caused by the feedback of systems tools and qualities that emerge anew. Integration fundamentally changes the content and structure of scientific knowledge, intellectual and conceptual capacities of individual sciences. This is an important means to achieve a semantic, structural, logical and gnoseological, systems and axiological, scientific and organizational, general methodological, and pedagogical unity of knowledge [6, p. 76].

Hence, the integration in the secondary school education shall be understood as the highest form of the expression of the unity of the purposes, principles, and content of the educational process, their functioning leading to the formation of qualitatively new integral system of knowledge and skills in students. First of all, this applies to the development and establishment of a new system of values in the context of the overall modernization of the educational system, which necessitates the organic combination of national and general human principles in the process of comprehensive education. This was reflected in the *conception of the integration of axiological and systems approaches to the development of ecological and humanistic values in the process of secondary school chemistry education*, which we developed. The following nine theoretical tenets, working together, represent this conception.

***1. The integration of axiological and systems approaches to the development of ecological and humanistic values in the process of secondary school chemistry education presupposes considering personal values from the perspective of the unity, interconnection of the composing elements, thus regarding them as an integral entity - a system of values.*** The methodological basis of this conceptual tenet consists of the following principles: 1) systems approach to the process of the formation of the system of personal values is based on the idea of its integrity; 2) comprehensive analysis of personal values involves distinguishing and substantiation of the most general, in some sense formalized, elements, the individual aspects of which can be described (in our study, “aspects” shall be the independent parts of an integrated structure, i.e., the parts or blocks of an integrated structure of values, which describe values in terms of motivation and meaning, process and effect, communication and orientation); 3) each aspect of the system of values is interpreted as a part of an integrated, indivisible system; the study of its various aspects and their components in synthesis is a necessary step; 4) the degree of the coherence of its various components can serve as an indicator of the level of the integrity of the system of values; and 5) integrity as a characteristic of the system involves the analysis of the hierarchical structure of its components.

In our opinion, when forming the system of personal values, it is worthwhile to study their axiological structure both from the perspective of the hierarchical organization of its components and the correlational structure, i.e., connections and relations within the aspects, as well as among these aspects. Thus, the values of the personality is a holistic phenomenon, a system of active compatible elements and specific axiological relations between them, which reveal the functional aspect of the personal meaning in the process of activity. The essential features of the system of personal values are: integrity, presence of multiple structures (complexity of hierarchical organization), integrality, openness, incompleteness, dynamism (the ability to change its state, while maintaining qualitative definiteness), self-development (self-regulation based on feedback), internal and external determinism, nonlinearity, and evolutionary nature [7, p. 20]. Yu. Shayhorods'kyi considers the hierarchical and correlational structure of a holistic system of personal values in the unity of the following aspects (and their components) - motivation and values, communication and orientation, process and effect [8, pp. 96 – 102].

The system of personal values is an integral internal and external indicator of the essence, integrity, and maturity of the individual in the variety and breadth, as well as across the multiple levels of values in their relations with one another and interconnections with other personal resources. A steady system of interrelated values has significant connections with peripheral values. Correlations of core and peripheral values provide insight into the breadth of the value system. Identification of significant positive and negative relations allows actualizing peripheral values by means of influencing those core values that correlate with them. The identification of significant relations between the leading group of values, their stability, breadth, and diversity will enable influencing personal and professional development and will give the opportunity to predict some models of human behavior not only in certain environment (society, nature) or in educational and professional activity, but in other circumstances as well. The awareness of the inter-relations mentioned above enables, by affecting one end of the interconnected chain in the process of specialized training, the modification of the other one end and, in general, change in the entire value

system of the personality. In this regard, the formation, restructuring, and development of a certain system of value relations will help the individual to independently maintain his/her sustainability and integrity, as well as his/her core personality characteristics in various circumstances [9, p. 9].

Thus, the formation of the system of values should be seen as the integrity, the understanding of which has been gained in the course of the internal dialogue, in which the combining of spiritual perspectives leads to the disintegration into sub-subjects. It should be noted that the internal dialogue is the basis of understanding the meaning of life. This understanding means, in the first place, the development of the main content of the conceptual core of self-consciousness, the essence of which is the understanding and experiencing of the meaning of life, which, in fact, is a core value of personality [10, p. 17].

***2. The integration of axiological and systems approaches to the development of ecological and humanistic values in the process of secondary school chemistry education requires the consideration, within the system of value orientations (values) of the personality, of a complex hierarchical structure, the components of which allow values to influence the mastery of ideals.*** The most successful attempt to develop a system of value orientations (see the table), which we took as a basis of this conceptual tenet, belongs to N. Astashova [11].

### **Value orientations as a multilevel system**

Value orientations	Common	Ideal	A perfect image, the highest aspirations
		Principle	The inner belief that defines norms of behavior
	Personal	Goal	The prediction of the result
		Attitude	Correlation of common and individual values
		Meaning	The deriving of the sense, by which evaluation takes place

In addition, the systems approach in axiology determines the hierarchy of values depending on the modus of the subject of the value attitude (M. Kahan, L. Stolovych, V. Lectors'kyi). At the same time, this subject can be one of the following: an individual; group or collective subject (a small direct-contact group or a unity of the nation, people, social class, etc., in which members do not come into direct contact with each other), humans in general, and the mankind as a subject of historical development. Therefore, values also can be individual, collective and group, and universal human [12].

Contemporary civilizational challenges require that ecological and humanistic values be regarded as an axiological subsystem of three systems of values: universal human, national, and individual. If universal human values serve for the preservation and development of the human race, the national ones ensure the reproduction and development of a certain ethnicity and, due to this, its individual members. The universal human is a meta-system regarding to the national, while the latter, in turn, is a meta-system for the personal. The latter two have axiological sense as long as they do not contradict, but promote the interests of the entire mankind. Structural components of national and personal/individual value systems correspond to those identified in the universal human hierarchy. At the same time, the universal human is asserted through the individual, whereas the individual is presented, instituted from the point of view of the law and values in the concept of "basic human rights" [13, p. 18].

Thus, a universal integrative field of universal human values is a kind of axio-sphere, which includes both values and the space of their functioning. Moreover, values fundamentally maintain their national and cultural characteristics, they do not dissolve in other values, but, in the course of their interaction and cross-fertilization with senses, temporal adjacent areas emerge. This leads not only to the identification of universal human values, but also to the enrichment of national, ethical, personal, and other values participating in the dialogue.

Depending on the modus of the subject of the value attitude, the hierarchy of values studied above correlates with the value system proposed by I. Meshkov.

Author divides the system of values into two value subsystems, relationship between which can be seen both from the moral and ethical point of view and from the point of view of the social needs of people: a static (stable) subsystem contains values that have remained unchanged over many centuries, these are universal human (humanistic, religious) and national values; a dynamic (unstable) subsystem includes values that vary depending on the needs of society, these are state, public (social), and personal values [14, p. 138].

The more clearly the system of universal human and national values (which most people are aware of) is articulated and objectively justified, the more clearly the orientation of the education system at the person is defined, the greater the basis for the personal value system will be. This will decrease the distance between universal human values and personal values, make the system of values, mastered by a person, more intense, complete, thus elevating the level of spirituality [15, pp. 33 - 34]. The above can be illustrated by the following scheme: actualization of individual moral values and senses → introduction to universal human values and identification of universal senses → replenishment and enrichment of personal moral values through the assimilation of universal human ones.

***3. Integration of axiological and systemic approaches to the development of ecological and humanistic values in the process of secondary school chemistry education presupposes the harmonization of binary value oppositions in the system of values.*** The methodological basis of this conceptual tenet is the orientation of the integration of the mentioned approaches toward overcoming contradictions between global and local problems, toward bringing up the citizen of the world without losing his/her “roots”, which, in turn, implies the formation of both universal human and national values.

Thus, the system of values is an ideal purposeful and self-organizing system. At the same time, in relation to each other, values can be in a binary opposition (e.g., “society – personality”, “activity – knowledge”, “development – instruction”, “autonomy – identification”, “national – universal human”, etc.). The transformation of binary value oppositions in the system of values is possible due to the following

options (mechanisms) of harmonization: the mechanism of mutual complementation, of relatively balanced interaction between and transition of one into another; the mechanism of productive dominant transformation; the mechanism of mediation; and the mechanism of productive creative integration [16, pp. 15 – 16]. In many cases, this is the selection of the mechanism of harmonization that defines the choice among the productive synthesis of values, their creative integration, hybridization, or the assimilation, one value taking over its opposition, or, else, the coexistence, mutual complementation of values. These are, for example, possible relations between national and universal human values in the educational space, excepting the cases of the conscious alienation and isolation of some values from others.

Thus, due to the systems and axiological integration of the personal, collective, national and universal human values, they are not opposed or diminished, but, rather, are consolidated, enriched, and replenished. The purpose of this integration is not the elimination of the diversity of values, but the provision of free choice for each person. That is why, when interacting, universal human and universal national values “are assimilated” into individual ones, but do not “cover” them completely, because each person possesses a distinctive, unique part of the spiritual world that is not subject to “universalization”.

***4. The integration of axiological and systems approaches in the process of secondary school chemistry education involves viewing ecological and humanistic values as a system with respect to its integrated components (humanistic values and ecological values) and simultaneously as a subsystem of the system of the individual values of a student.*** The methodological basis of the given conceptual tenet is the provisions of our conception described above, as well as the distinguished by us axiological components of the systems of humanistic and ecological values in the process of secondary school chemistry education.

The conjugation of the system of humanistic values and the system of ecological values leads to the formation of a unified integrated entity - a system of ecological and humanistic values. We include the following values with its basic components: person, his/her “I”, humankind, society, nature, biosphere, the Earth, the

Universe; life, meaning of life, health, healthy lifestyle, life safety (ecological chemical safety), satisfactory environmental conditions as a precondition for life; humanity, dignity, self-restraint, the value of communication; maintaining high moral standards in approaching nature and people, valuing them, positive individual environmental responsibility, eco-centric environmental awareness, preservation of nature and the environment for the forthcoming generations; scientific and cultural assets, scientific picture of the world; and free choice and creativity.

In a unified system - a system of ecological and humanistic values – the relationship between its subsystems, i.e., humanistic values and ecological values, can take the following forms of expression: 1) distinctive general eco-ethical culture of students; 2) results of students' eco-ethical and chemically safe activities and creative products of these activities; and 3) balanced and harmonious relationship between students and the surrounding social and natural world.

In turn, individual values in the system of ecological and humanistic values are closely interconnected: care for *life* becomes care for a *person*, love for *nature* comes along with a desire to improve the life of *society*, whereas *dignity*, which reflects the attitude to one's "I", is directly and continuously expressed through the attitude towards the life of the entire *mankind*. Life proper, life as a phenomenon of the Universe and as a gift from the Earth is perceived and lived by a spiritual person only if he/she has "mastered, assimilated, and adopted" the entire system of such values. One cannot love life without loving a person. Along the same lines, there is no love for life in the absence of the care for nature [17, p. 8]. Therefore, the question of the formation of ecological and humanistic values can be successfully addressed only within the context of forming the entire system of individual values of students.

***5. The integration of axiological and systems approaches to the development of ecological and humanistic values in the process of secondary school chemistry education as priority educational values should be based on the following principles of the logical and structural construction of pedagogical axiology:*** principle of historical and socio-cultural relativity of educational values; principle of the interaction between socio-cultural and educational values; principle of the

correlation of social and personal values; principle of the integration of traditional and innovative values. These principles reflect the hierarchy of educational values. These are *dominant* (knowledge, cognition, creativity, value of communication), *normative* (educational standards, moral norms), *stimulating* (methodology, traditional and innovative educational techniques and values of control), and *concomitant values* (values aimed at the quality of cognition: meta-cognitive skills, student's understanding of the objects and phenomena that are studied), which are interrelated and constitute the theoretical basis of pedagogical axiology, helping to create active and creative behaviors, aimed at the generation of the material and spiritual assets of society [18, pp. 113 – 119].

***6. The integration of axiological and systems approach in the development of ecological and humanistic values in the process of secondary school chemistry education should be seen as a stimulating innovative educational value-technique.***

The hierarchy of educational values introduced above constitutes the methodological basis of this conceptual tenet in the context of the principles of logical and structural construction of pedagogical axiology.

Developing ecological and humanistic values, the teacher of chemistry can use the integration of axiological and systems approaches as: *a technique* – step-wise introduction, actualization, and combination (in the course of mastering values) of values in the educational process in accordance with the content of chemistry as an academic discipline and the developmental profile of students; *a method* – building interaction with students on the axiological basis, gradually introducing the system of interrelated subject values; and as *a tool* – ensuring timely actualization of the most important personal values of students to address emerging educational challenges. At the same time, at the beginning of the secondary school chemistry course (adolescence, 7<sup>th</sup> – 8<sup>th</sup> grades), this integration takes place within the course of the intellectual and critical mastery of values, whereas in the high school values are integrated in the philosophical and ideological context.

The integration of axiological and systems approaches in the process of secondary school chemistry education in order to form ecological and humanistic

values in students may be carried out by means of: the identification of the universal axiological laws typical for chemistry, ecology, and other sciences; the introduction of the education material from cultural and historical, as well as from eco-ethical angles, which reveals its universal and personal significance; figurative and metaphorical perception of knowledge, as a result of which it acquires subjective expression, as well as spiritual and moral coloring; interpretation of scientific theories, events, and facts through the prism of the worldview of individual scientists as carriers of different values.

To achieve this integration, the following system of integration mechanisms should be used: dialogization, improvisation, interpretation, identification, extrapolation, polyphonization, individualization, assimilation, and conceptualization [2, pp. 14 – 15]. As a result of the integrated mastering of ecological and humanistic values, the knowledge, ideas, problems, and perspectives introduced to students immerse into different semantic contexts, their universal and personal significance emerging due to the mentioned above integration mechanisms.

***7. The integration of axiological and systems approach to the development of ecological and humanistic values in the process of secondary school chemistry education entails the transformation of eco-chemical concepts into the values important to the inner world of students.*** The implementation of this conceptual tenet requires, first of all, that “values” and “concepts” be conditionally differentiated. At the same time, it is important to note that a term can become a concept and, simultaneously, a value, so they are dialectically interrelated. At the initial stage, values are often formulated as concepts with more or less stable meaning, and only the integration that follows provides additional context (historical, cultural, etc.), “bringing them to life”. The structure of values can, therefore, be represented by the following components: objective meaning → objective senses → subjective senses → objectified senses [Ibid, pp. 9 – 10]. Thus, the essence of the integrative mastery of ecological and humanistic values is in “bringing them to life”, in “fleshing them out”, so that students could see their full potential with regard to the meaning of their lives.

To achieve this end state, values must come into interaction with students' inner world and obtain subjective significance.

**8. *The integration of axiological and systems approach to the development of ecological and humanistic values in the process of secondary school chemistry education entails viewing the world as a holistic integrated system (one and diverse) in which a person becomes part of the picture of the world (Weltbild) and is responsible for his/her own destiny, lives of the people around and for the future of the world.*** The methodological foundation of this conceptual tenet is a doctrine of the unity of nature and anthropological factors, as well as a systems-structural approach to the analysis of any phenomenon of nature and human activity.

The traditional system of natural sciences education divides the natural world perceived by the student into physical, chemical, biological, etc., thus, violating his/her natural sciences need for a holistic perception of the Universe's structure. The formation of ecological and humanistic values of students in the context of a holistic perception of the world as a condition for the formation of a new worldview and the development of global thinking presupposes the implementation in the content of chemical education of the methodology of systems and holistic approach – seeing the world as a global interdependent unified system, as the system of systems: the world is a holistic system that includes local, regional, and global subsystems; the world is an integrated system based on multidimensional interdependencies between different subsystems; the world is a self-organizing live system that is based on the principles of homeostasis and balance; and the world is a developing system, for which a balanced development is important, and in which any imbalance causing global problems [19, pp. 239].

Thus, only systems and axiological integration allows studying the world around (people, society, civilization, culture, intelligence, animate and inanimate nature, ecology, the Universe) not fragmentarily, but as one complex global self-organizing system, which leads to the formation of a holistic view of the sustainable development of the social and natural environment. The human being is, therefore, seen as a unique holistic personality that develops in the process of the active self-

realization of the creative potential in a system of interactions with other people and the world.

***9. The integration of axiological and systems approach in the process of secondary school chemistry education affords further inclusion of the existing ecological and humanistic values into the structure of chemical and axiological consciousness of students and their chemo-environmental competency.*** The methodological basis of this conceptual tenet is the consideration of values as capable of determining the meaning of human, social, and cultural phenomena of reality. It allowed us to build a chain-system leading to the emergence of chemical and axiological consciousness of the student: culturological and social value orientations → educational values (subject values) → personal senses (awareness of the value of knowledge for the realization of purposes) → individual values → axiologization and socialization of the personality (integration of values) → chemical and axiological consciousness. This way of the formation of chemical and axiological consciousness is only possible subject to the integration of the systems and axiological perception of chemical knowledge.

Competency-based approach changes the stages that constitute the integrative essence of axiological and systems approaches in the mentioned above chain: personal senses (individual's systems of values) → substantiated axiological motivation (re-directing value orientations to knowledge, its creative comprehension) → formation of personality's competencies → chemo-ecological competency [20].

Therefore, the detailed analysis of the conception developed by us showed that the integration of axiological and systems approaches to the development of ecological and humanistic values in the process of secondary school chemistry education ensures: the formation of such holistic constructs as “culture”, “world's image”, “natural sciences picture of the world”, “worldview”; emphasis on the contextual (multilayered) thinking, which actualizes various scientific, as well as cultural and historical senses in their indissoluble unity; strengthening of personal axiological motivation, which contributes to the emergence of the interest in and the

need for the study of chemistry; axiological support of the ties among the elements of the acquired knowledge; preserving the integral unity and the unique expression of the most important values, while values organically integrate into the human consciousness and become the basis of the person's subjective attitude to the world; perspective of rethinking the goals and objectives of teaching chemistry, finding in it the dimension of values, organic and holistic introduction of the questions personally meaningful for both the student and the teacher; further inclusion of the existing ecological and humanistic values into the structure of chemical and axiological consciousness of students and their chemo-ecological competency.

We see further research into this matter in building a pedagogical system of the development of ecological and humanistic values in the process of secondary school chemistry education on the basis of our conception.

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## **Роман С. В. Концепція інтеграції аксіологічного й системного підходів для формування еколого-гуманістичних цінностей у процесі шкільної хімічної освіти**

Інтеграція в шкільній освіті повинна становити вищу форму вираження єдності цілей, принципів і змісту організації процесу навчання й виховання, результатом функціонування яких є формування в школярів якісно нової цілісної системи знань і вмінь. Це стосується насамперед вироблення й утвердження нової системи цінностей у контексті загальної модернізації системи освіти, що приводить до потреби органічного поєднання в загальноосвітньому процесі національного та загальнолюдського начал і відображене в розробленій нами концепції інтеграції аксіологічного й системного підходів у формуванні еколого-гуманістичних цінностей у процесі шкільної хімічної освіти, яка представлена сукупністю дев'ятих теоретичних положень.

*Ключові слова:* концепція, інтеграція, аксіологічний підхід, системний підхід, еколого-гуманістичні цінності, шкільна хімічна освіта.

## **Роман С. В. Концепция интеграции аксиологического и системного подходов при формировании эколого-гуманистических ценностей в процессе школьного химического образования**

Интеграция в школьном образовании должна представлять собой высшую форму выражения единства целей, принципов и содержания организации процесса обучения и воспитания, результатом функционирования которых является формирование у школьников качественно новой целостной системы знаний и умений. Это касается, прежде всего, выработки и утверждения новой системы ценностей в контексте общей модернизации системы образования, что приводит к потребности органического сочетания в общеобразовательном процессе национального и общечеловеческого начал и нашло отражение в разработанной нами концепции интеграции аксиологического и системного подходов при формировании эколого-

гуманистических ценностей в процессе школьного химического образования, которая представлена совокупностью девяти теоретических положений.

*Ключевые слова:* концепция, интеграция, аксиологический подход, системный подход, эколого-гуманистические ценности, школьное химическое образование.

### **Roman S. V. The Conception of the Integration of Axiological and System Approaches to the Development of Ecological and Humanistic Values in the Process of Secondary School Chemistry Education**

Integration in the field of secondary school education should represent the highest form of the expression of the unity of the purposes, principles, and content of the organization of the process of training and education, the functioning of which leads to shaping a qualitatively new holistic system of knowledge and skills in students. It concerns, in the first place, the need for the development and establishment of a new system of values in the context of the general modernization of educational system. To address this need, the author attempted to create a conception of the integration of axiological and system approaches to the formation of ecological and humanistic values in the process of secondary school chemistry education.

Such integration entails the search for the universal axiological regularities typical for chemistry, ecology, and other sciences; maintaining cultural and historical, as well as ecological and ethical focus when presenting educational material; emphasis on the figurative and metaphorical perception of knowledge through which it acquires subjective expression and spiritual and moral meaning for students; interpretation of scientific concepts, events, and facts through the prism of the frame of reference of individual scientists as carriers of different values.

*Key words:* concept, integration, axiological approach, system approach, ecological and humanistic values, secondary school chemistry education.

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