

## Formation of ecological competence of future biology teachers in the process of professional training

## Formação de competência ecológica de futuros professores de biologia em processo de formação profissional

## Formación de la competencia ecológica de los futuros profesores de biología en el proceso de formación profesional

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### ABSTRACT

The article highlights the issue of forming the ecological competence of the future biology teacher, based on global violations of the global ecosystem, the devaluation of the importance of preserving the environment, its resources, role in life and human health. It is emphasized that the sustainable development of society involves determining the value priorities of establishing the responsibility of each individual citizen and society as a whole for the consequences of environmental activities in order to preserve and protect the environment. The importance of continuous environmental education, in particular in pedagogical educational institutions, has been established.

**Keywords:** Educational technologies. Environmental competence. Future biology teachers. Project activities. Ways of formation.

### RESUMO

El artículo trata sobre la formación de la competencia ecológica del futuro profesor de biología, a partir de las violaciones globales del ecosistema global, la desvalorización de la importancia de la preservación del medio ambiente, sus recursos, papel en la vida y la salud humana. Se enfatiza que

el desarrollo sostenible de la sociedad implica determinar las prioridades de valor de establecer la responsabilidad de cada ciudadano individual y de la sociedad en su conjunto por las consecuencias de las actividades ambientales con el fin de preservar y proteger el medio ambiente. Se ha establecido la importancia de la educación ambiental continua, en particular en las instituciones educativas pedagógicas.

**Palavras-chave:** Actividades del proyecto. Competencia ambiental. Futuros profesores de biología. Modos de formación. Tecnologías educativas.

## RESUMEN

O artigo destaca a questão da formação da competência ecológica do futuro professor de biologia, com base nas violações globais do ecossistema global, a desvalorização da importância da preservação do meio ambiente, seus recursos, papel na vida e na saúde humana. Ressalta-se que o desenvolvimento sustentável da sociedade envolve a determinação das prioridades de valor de estabelecer a responsabilidade de cada cidadão individual e da sociedade como um todo pelas consequências das atividades ambientais a fim de preservar e proteger o meio ambiente. A importância da educação ambiental continuada, em especial nas instituições de ensino pedagógico, foi estabelecida.

**Palabras clave:** Actividades do projeto. Competência ambiental. Formas de formação. Futuros professores de biologia. Tecnologias Educacionais.

## INTRODUCTION

Society's environmental security is linked to the level education, culture and upbringing of its representatives. The problem of formation of ecological competence is important in pedagogy. It is especially relevant in the context of education sustainable development. The ecological crisis encourages a rethinking of relations in the system "nature - man - society "and finding ways to harmonize them. In this context, the problem of training is relevant future teachers, in particular biology, to the development of environmental competence of school students. In the "Program of Action" to implement the provisions of Bologna Declaration in the system of higher education and science of Ukraine emphasizes the creation of a system for determining the level of competence of university graduates and the development of methods objective assessment of the level of competence of specialists of certain educational and qualification levels in Ukraine. An important role in this task is played universities, because they create the necessary conditions for free development, formation of a stable ecological position and professional competence of the student, in particular ecological competence.

## METHODOLOGY

The work is formed based on the use of general theoretical methods of research, in particular, the article used the principles of analysis, synthesis, induction, and deduction.

## LITERATURE REVIEW

The problem of preparing biology teachers for environmental education and upbringing of students in its various aspects was addressed Bondarenko et. al. (2019) formation of readiness of students of natural and geographical faculties of pedagogical universities for local lore work with students, Shageeva et. al. (2020), Mishchenko (2019) pedagogical bases of future teachers' preparation rural ZNZ, Skorokhod & Rudenko (2016) formation of readiness of future teachers of natural sciences to educate students in a healthy lifestyle), Sovgir (2017) preparation of future teachers for environmental education of high school students on local history material, Biletska et.al. (2021) preparation of future biology teachers for environmental education) high school

students), Syvyi et.al. (2022) preparation of future teachers of geography and biology for local history and tourism activities with students), Chisingui & Costa (2020) preparation of future teachers of biology for the formation of environmental culture of high school students), Bezborodova et.al. (2019) didactic bases of training students - future teachers of biology implementation of environmental education); Shapran (2018) theoretical and methodological principles of forming the professional competence of future biology teachers) and others. The analysis of psychological and pedagogical literature shows the ambiguity of approaches to determining the structure of environmental competence. Despite numerous works, which considered the components, criteria, indicators, components of environmental competence, there is no generally accepted definition of the structure of environmental competence, as well as the concept of "readiness of future biology teachers to develop environmental competence" in students in particular.

The formation of environmental competence of university students is a continuous process of their constant involvement in environmental activities by gaining experience in practical work to preserve and improve the environment, development of environmentally significant personal qualities, including: humanity, empathy, thrift based on active learning technologies. According to Shapran (2018), pedagogical universities play a special role in the formation of environmental competence. They create the necessary conditions for the formation of a sustainable environmental position, awareness of their own involvement in environmental issues, taking into account in the professional, social and domestic spheres of the impact on the environment. Teacher-practitioner has significant opportunities for the formation of similar competencies in their students. This also applies to future biology teachers.

The set of concepts "readiness of future biology teachers to develop students' environmental competence" is considered to be an integrative dynamic quality of personality, which is manifested in: students' attitude to the development of students' environmental competence; students' awareness of motives and needs in this activity; availability of deep and diverse subject knowledge in the disciplines of the chosen specialty and environmental, psychological and pedagogical, socio-environmental, methodological knowledge, skills and abilities in relation to the development of environmental competence of primary school students. There are differences in the definition of "structure" (Koval & Pogasiy, 2018).

It should be noted that most scientists recognize that the structure contains not only the scheme of relationship, order of the elements of the system, but also these elements. Cognitive, axiological and praxeological components become important in the structure of the future teacher's ecological worldview. On the basis of certain structural components of the ecological worldview of the future teacher, his types are substantiated, which are indicators of the formation of knowledge, views and beliefs of future teachers on the interaction of man and nature: anthropocentric, situational, ecocentric. They differ in the views of the individual on the place in nature, its attitude to environmental problems and their solutions (Bayurko, 2017).

Structurally, "environmental competence", including knowledge and skills, emotions and values, practical activities and behavior, is almost identical to the "environmental culture of the individual." Therefore, it is important to understand the relationship between these concepts in order to understand the problem. The concept of "ecological culture" can be used not only to characterize the individual, but also in relation to certain groups of people, society as a whole, which always needs to be clarified. The concept of "competence" immediately has a personal orientation and is not used to characterize society.

Thus, Kholoshyn et. al. (2020) defines the following components of students' ecological consciousness: cognitive-emotional, intellectual, activity-behavioral and orientation component. The cognitive-emotional component, in our opinion, contains the main cognitive processes (feelings, perceptions, memory, thinking, imagination), through which students enrich their own knowledge and emotional and volitional sphere. The intellectual component is a set of theoretical

propositions obtained on the basis of collected and processed information about the interaction of society and nature. The focus component contains a system of values, ideals, attitudes, stereotypes, goals and motives that determine the overall strategy of environmental activities and behavior. The activity-behavioral component reflects the program of actions for the implementation of the previous components. According to the structure of ecological competence in the study Kholoshyn et.al. (2021, March) identified criteria for the formation of this quality in students, which include: awareness of environmental issues, awareness of environmental problems of local rank, experience in solving environmental problems (information and experimental component); the place of ecological values in the hierarchy of personal, the nature of the attitude to nature (motivational-value component), ecologically safe behavior and activities in the professional and domestic spheres (activity-behavioral component); willingness to make decisions and act in the environment with minimal harm to him, responsibility for the environmental consequences of their own activities (Buzenko, 2017). In the structure of ecological competence of future biology teachers Shapran (2018) singles out motivational-value (complex of needs, motives, interests, value orientations, orientation on realization of ecologically directed professional abilities); cognitive-activity (complex of ecological knowledge, skills and abilities, practical readiness to carry out ecologically expedient activity) and personal-reflexive (complex of personal qualities important for ecological activity - cooperation, humanism, responsibility, communicativeness, empathy, optimism, emotional stability, reflection, etc.) components. The study of the literature on environmental competence revealed that scientists identify three components of environmental competence, through which it is possible to form in students in secondary schools in biology lessons can be formed in students, including: 1) personal, 2) cognitive, 3) activity.

The personal component is aimed at realizing oneself as a part of nature through the formation of ecopsychological consciousness. It provides awareness of the need for a healthy lifestyle and its role in self-development and self-realization of the individual, promotes the formation of personal competence of students, and provides students with awareness of the essence of man, the norms of his behavior. The cognitive component is the basis of the ecological worldview and is expressed in the worldview, worldview and worldview of man (Biletska et. al., 2022). The activity component provides students with mastery of worldview knowledge in the process of forming a natural-scientific picture of the world on the basis of scientific knowledge about nature, which is the basis for the formation of environmental competence of students.

Ecological knowledge is a developed idea of the environment, man's place in it, his dependence on the state of animate and inanimate nature. The content of ecological knowledge includes: the presence of ideas about: methods of analysis and modeling of ecological processes; consequences of anthropogenic impact on the biosphere; planning measures for its protection; ecological principles of rational attitude to nature; goals and objectives of environmental education; programs, textbooks and manuals. This summarizes the knowledge of biology in general and methods of teaching biology in particular (Araújo, & Bizzo, 2015). Thus, the materials of theoretical analysis prove the complexity and multifaceted nature of the concept of "readiness of future biology teachers for the development of environmental competence" of students. Since this concept is a holistic dynamic quality of the student, in our opinion, it involves the functioning of axiological-motivational, knowledge-information and technological-reflexive components. The basis of the axiological-motivational component is: the need of students to carry out environmental activities, a conscious responsible attitude to the environment, and so on. Components of the knowledge and information component are awareness of environmental issues, deep and diverse knowledge of students in the disciplines of the chosen specialty, pedagogy, psychology, specific teaching methods and more. Leading methodological skills that characterize the technological and reflexive component of the studied personal quality of the student biologist are the mastery of methods and techniques for the development of environmental competence of primary school students.

According to Kotyash (2019), ecological knowledge is professionally necessary because it forms students' scientific worldview, contributes to the correct understanding of processes and natural phenomena, patterns of functioning of living organisms, their groups and the biosphere as a whole as a global ecological system that stimulates interest in their knowledge and concern for the environment. In the general scientific interpretation, ecological knowledge expresses the generalized experience of mankind, which contains facts, principles, ideas, concepts, laws, hypotheses, theories, conclusions. In the personal sense, environmental knowledge is part of the experience of the individual, which includes information about certain phenomena or processes and human attitudes to them. Therefore, we believe that it is expedient to single out the knowledge and information component "readiness of future biology teachers for the development of environmental competence" in primary school students. Competence integrates internal and external components of behavior, reflecting not only knowledge of how to act, but also specific skills to apply this knowledge in a given situation. The formation of competence focuses on developing their own models of behavior in different situations, their author's approbation, as well as adaptation to the value orientations of the individual.

In our opinion, Gerasimchuk (2017) opinion is quite correct that environmental competence includes: design, management, evaluation and research skills for environmental activities. The basis is the environmental skills of the future biology teacher, the ability to form an environmental culture of high school students, as well as evaluation - a comparison of existing and significant, useful and harmful. It is important for a future biology teacher to be able to predict the more characteristic properties and features of the activities for the formation of ecological culture of high school students and on this basis to predict the necessary stages. This function is more fully manifested in the activities of the teacher at the stage of pedagogical decisions.

Along with the study of environmental competence in the scientific literature, there are often developments in which the authors reveal contextually related concepts, in particular, "environmental awareness", "environmental culture". Thus, ecological consciousness is defined as the awareness of man (society) of the aggravation of the ecological situation and the negative consequences of the ecological crisis; ability and habit to act in relation to nature so as not to disrupt the connections and cycles of the natural environment; to promote the improvement and protection of the environment for the sake not only of the present but also of future generations. At the same time, the authors' approach to the disclosure of such types of ecological consciousness as anthropocentric and ecocentric is considered interesting. Anthropocentric ecological consciousness is characterized by the following postulates: man is the highest value, nature is his property; nature is considered as an object of one-sided human action; the nature of the motives and goals of the interaction of man and nature is pragmatic. In the context of our study, ecocentric environmental awareness is important, which is manifested in the individual's understanding of the nature of environmental problems, their nature and sources of development, awareness of the role and opportunities of environmental education in solving relevant problems; the need to personally participate in environmental activities, moral responsibility in relations with nature; ability to conduct educational work. Thus, it is ecocentric environmental awareness involves a conscious understanding of future teachers of the importance of environmental education, their motivated, valued attitude to environmental protection, to identify environmentally sound behavior, empathy for problems arising in the natural environment.

"Environmental competence" actualizes mostly subject-practical activities of the individual, it is the possession of certain patterns of behavior in environmental situations, based on the acquired knowledge, skills and abilities to behave in them; it is a person's ability to develop their own algorithms of action, to form new behavioral models, adapting them to contextually new circumstances and their own value system. "Ecological culture" is a spiritual basis that contains the value orientations of man to protect the natural environment, conservation of its resources, is a

kind of imperative of environmental actions of the individual, which determines the choice of decision, direction of behavior and is not tied to a particular situation. "Environmental consciousness" is a mandatory component of the relevant competence of the individual and the highest manifestation of his culture.

## DISCUSSION

In the world of modern world trends of rapid development of scientific and technological progress there is a deterioration of the environment, including environmental pollution, depletion of natural resources, devaluing the values of environmental awareness, thinking and culture of the population. In such conditions, the problem of harmonization of relations between society and nature, the formation of community values to preserve the environment, awareness of its importance in life and maintaining the health of everyone is extremely acute. Sustainable development of society involves the formation of axiological priorities of responsibility of every citizen and humanity in general for the consequences of their own environmental actions and their impact on the state and future of world civilization. The formation of environmentally conscious personality occurs under the influence of parents, close environment, in the process of education and more. The personality of the teacher, with a high level of environmental awareness, culture, competence is a model for students to follow the patterns of environmentally sound behavior and a specialist who will instill in them a caring attitude to natural resources, the value of maintaining their own health and environment. Thus, the formation of environmental competence of future teachers becomes one of the priorities of higher pedagogical education to ensure sustainable development of society. The Concept of Environmental Education in Ukraine emphasizes the importance of its continuity, in particular in educational institutions at various levels - from preschool to postgraduate. An important role is given to institutions of higher pedagogical education in the formation of environmental culture of future teachers, who must master the methods of environmental conservation educational work with the school-frame. At the same time, the task of forming ecological competence of future teachers is conditioned by reforming the system of general secondary education, which is regulated by a number of legislative and normative documents: the concept of the Law of Ukraine "On Education" (2017), Of Ukraine "On complete general secondary education" (2020). One of the ten key competencies of the new Ukrainian school is defined as environmental literacy and healthy living, which is manifested in the ability to use natural resources wisely and rationally within the framework of sustainable development, awareness of the role of the environment for life and human health, ability and desire to follow a healthy lifestyle New Ukrainian school: conceptual principles of secondary school reform, 2017). Therefore, the professional training of future biology teachers should ensure the formation of ecological culture, new models of ecological thinking and activity.

At present, Ukraine has radically changed its approach to determining the qualification requirements for graduates of pedagogical universities, based on the basic provisions of the competency approach, which is rightly considered an innovative tool to improve the quality of education, update its content and modernize in accordance with European educational standards. Modern environmental education has also undergone fundamental changes aimed at forming a set of personal qualities that allow you to consciously apply the acquired theoretical knowledge in practice, ie it is about the competence of the individual. The Law of Ukraine on Higher Education defines the concept of "competence" as the ability of a person to successfully socialize, learn, conduct professional activities, which arises on the basis of a dynamic combination of knowledge, skills, thinking, attitudes, values and other personal qualities.

Among the essential features of students' ecological competence are their value orientations, motivation to carry out ecologically oriented activities, mastery of the system of ecological knowledge and experience of environmental activities, ability to communicate in the field of

ecological activities, desire for professional development and personal self-development throughout life. Ecological competence synthesizes personal qualities, creative abilities, knowledge, skills, individual experience, the integrity of which ensures a person's ability to motivate to build their lives in harmony with the environment, social, personal needs and values, aware of their responsibility for the impact of their professional and domestic activities. Environmental competence is based on subjective values, meanings, beliefs, knowledge, skills, volitional qualities of the individual and is situationally manifested in practice. An environmentally competent person strives to solve life situations responsibly and builds his or her own life based on the priority of environmental values.

## CONCLUSION

Ecological competence of the future biology teacher is an integrative formation of his personality, which contains knowledge, skills, skills of nature conservation, is manifested in a conscious value attitude to solving problems of environmental protection, allows to form environmentally sound models of behavior in appropriate situations, make informed decisions. take responsibility for their consequences to themselves, their students and society. Detailing the given definition, we should add that the formed ecological competence of the school teacher is manifested in the developed emotional-volitional, motivational-value spheres of his personality, in the ability to reflect, which generally testifies to his professional readiness to carry out pedagogical eco-activities. and social maturity of the specialist. This is exactly the kind of teacher a new school needs, a teacher with a high level of environmental competence, who will instill in students the value of environmental literacy and importance of preserving the environment.

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