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## **PECULIARITIES OF PROFESSIONAL TRAINING TEACHERS OF NATURAL SCIENCES IN THE CONTEXT OF EDUCATION FOR SUSTAINABLE DEVELOPMENT**

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**Abstract.** The article highlights that in today's world, shaped by globalization, social and natural upheavals, and military conflicts, the development of a paradigm for education aimed at sustainable development is gaining momentum. This paradigm emphasizes fostering an ecocentric environmental consciousness among student youth. The youth's qualitative indicators are: orientation towards ecological expediency; avoidance of confrontation between man and the environment; harmonious balance of pragmatic and consumer interaction with nature. Emphasizing the role of natural science teachers as key agents in advancing sustainability, the article argues that achieving this educational paradigm requires attention to professional, cultural, social, and personal factors. It has been proven that the implementation of the education program for sustainable development requires taking into account professional, cultural, social and personal conditions. Educational practices of such implementation in the process of professional training of specialists of the specified profile have been considered.

**Keywords:** education for sustainable development, professional training of science teachers, environmental awareness, educational environmental practices.

## **PARTICULARITĂȚI ALE FORMĂRII PROFESIONALE ALE CADRELOR DIDACTICE DE ȘTIINȚELE NATURII ÎN CONTEXTUL EDUCAȚIEI PENTRU DEZVOLTARE DURABILĂ**

**Abstract.** În articol se discută că în lumea modernă, sub influența fenomenelor de globalizare, cataclisme sociale, naturale și acțiuni militare, se conturează procesele de formare a paradigmei educației pentru dezvoltare durabilă. Paradigmele țin cont de tipul ecocentric de conștiință ecologică a tinerilor studenți. Indicatorii calitativi ai tinerilor sunt: orientarea către oportunitatea ecologică; evitarea confruntării dintre om și mediu; echilibru armonios al interacțiunii pragmatice și a consumatorului cu natura. Subliniind rolul profesorilor de științe naturale ca agenți cheie în promovarea durabilității, articolul susține că realizarea acestei paradigme educaționale necesită atenție la factorii profesionali, culturali, sociali și personali. S-a dovedit că implementarea programului de educație pentru dezvoltare durabilă necesită luarea în considerare a condițiilor profesionale, culturale, sociale și personale. Au fost luate în considerare practicile educaționale ale unei astfel de implementări în procesul de formare profesională a specialiștilor de profil specificat.

**Cuvinte cheie:** educație pentru dezvoltare durabilă, formarea profesională a cadrelor didactice de științe, conștientizarea mediului, practici educaționale de mediu.

### **Introduction**

The prerequisite for the inclusion of Ukraine in the single European educational space is the introduction of the ideas of environmentalism into the practice of professional

training. The necessity of enhancing the national education system through the integration of sustainable development principles has become a critical priority. In response, the Ministry of Education and Science of Ukraine has initiated the development of several regulatory documents, including the Law of Ukraine "On Higher Education" (2017), the Sustainable Development Strategy of Ukraine until 2030 (2017), the State Standard of Basic Education (2020), the Sustainable Development Strategy "Ukraine – 2020," and the professional standard "Teacher of General Secondary Education" (2021), among others. These documents advocate for the establishment of an educational environment within pedagogical universities that fosters the development of modern educators capable of independently addressing challenges in their professional activities while advancing the principles of sustainable development.

The basis of the proposed study is the analysis of publications included in the Web of Science and Scopus science databases. Various aspects of the issue of environmental education for sustainable development in universities have been explored in the works of Álvarez-García, J., Boca, G.D. Chavez, E., Braus, J., Kyridis, A., Munardji, M., Zeqir, V. and others [1-3, 5].

The authors of the analyzed studies claim that further unresolved environmental problems will lead to a biosphere crisis of society, which will make its comfortable existence impossible. In this aspect, it is worth emphasizing the negative impact of military actions on ecosystems conducted by the Russian Federation on the territory of Ukraine, which lead to destruction and decrease in bio-productivity, threats to the integrity of biodiversity.

This statement is confirmed by the aggressor's use of unguided aerial bombs, phosphorus munitions, destruction of critical structures (energy facilities, chemical and fuel-lubricant storage facilities, detonation of the Kakhovskaya HPP, etc.) during military operations. The burning of forests, agricultural lands, the polluting of the Seim and Desna rivers with poisonous substances are factors in the destruction of biota. In addition, industrial and technological challenges provoked by the state of war and the imperfection of the system of national control over the production activities of entrepreneurs pose a special threat to our state.

In the process of professional training of naturalists, there is an urgent problem of their understanding of educational technologies regarding possible ways of minimizing such negative impact on the environment, which is the basis for the implementation of ideas of sustainable nature management. The modern specialist is assigned the role of a direct participant in the formation of a new ecological outlook. The introduction of sustainable development ideas into the process of professional training of science teachers is of particular importance. They are best acquainted with the concept of sustainable development. There is no objection to the thesis that science teachers should become

leading agents of social change in the direction of movement towards sustainability, subjects of ensuring the prerequisites for the co-evolutionary development of society and the biosphere.

The importance of the system of training teachers of natural sciences to implement the functions of education for sustainable development is invaluable, because its implementation requires taking into account a certain set of conditions:

- professional (provide professional development based on ideas, values and principles of sustainable development);
- cultural (contribute to the development of the material and spiritual culture of a sustainable society in the process of future professional activity);
- social (encourage the formation of environmental awareness and individual styles of nature-appropriate behavior);
- personal (develop individual abilities and creative potential of the individual in the aspect of environmental protection activities).

Taking into account all of the above, it is worth noting that at the University of Grigory Skovoroda (Ukraine) students of higher education are trained under the educational and professional programs «Secondary Education (Biology and Human Health)», «Secondary Education (Natural Sciences)». In the process of implementing these programs, an important principle is to ensure the integration of the concept of sustainable development in each educational component (at the natural-mathematical, social-humanitarian, and philosophical levels).

To integrate the positive advancements of European education into Ukrainian university practices, the Department of Natural Sciences and Teaching Methods has initiated the educational and scientific project "Modernization of the Content of Professional Training for Natural Science Teachers Based on Education for Sustainable Development: The EU Experience for Ukrainian Universities." The project includes:

- ✓ Analyzing professional training methods for natural science teachers in European countries and identifying ways to adapt them to Ukraine's higher pedagogical education system.
- ✓ Synthesizing, systematizing, and piloting research findings during the professional training of natural science specialists.
- ✓ Developing and implementing the special course "Environmental Education" at Hryhoriy Skovoroda University in Pereiaslav.
- ✓ Creating and introducing the "Education for Sustainable Development" training program for practicing natural science teachers.
- ✓ Expanding the application of both the "Environmental Education" course and the advanced training program "Education for Sustainable Development" across Ukraine's educational environment (in partner universities: Chernihiv Shevchenko

National University; Poltava National Pedagogical University named after V. G. Korolenko Ivan Franko State University, Uman State Pedagogical University named after A.S. Makarenko, Kharkiv Regional Pedagogical Academy, etc.).

Cooperation with European universities Institute for Research, Innovation and Technology Transfer «Ion Creangă» State Pedagogical University (Chisinau, Republic of Moldova), Institute of Biology, Pomeranian University in Słupsk (Poland), representatives of international transnational foundations and regional centers (ADRA Polska Foundation, Integration Center for Foreigners (Katowice, Poland), Regional Center for Blood Donation and Blood Treatment named after John Paul II (Poland).

Communication with international public organizations is carried out on the basis of joint lectures, training sessions and conferences. The purpose of this activity is to introduce the ideas of sustainable development into educational practice, to restructure people's moral consciousness, and to cultivate a caring attitude towards the environment, the formation of individual responsibility for the state of nature, the introduction into practice of the principles of harmonious coexistence of man and nature.

It is indisputable that education for sustainable development should be aimed at developing environmental awareness. The implementation of the paradigm of a sustainable development society into the practice of a higher school led to the emergence of the concept of «ecological consciousness of the ecocentric type». It is characterized by: ecological orientation of the being of each individual; harmonious relationship between man and nature; perception of natural objects as full-fledged and interdependent subjects; optimal balance of pragmatic human interaction with the components of the environment.

In the process of conducting experimental work, it was established that an effective form of development of students' environmental knowledge is their involvement in informational and educational activities with students of general secondary education during pedagogical practices. Students have great opportunities to highlight existing environmental problems among junior, elementary and high school children using self-created presentations and video materials.

Important in this process is the organization and holding of various environmental trainings, during which the participants of the educational process develop rational ways of solving certain environmental problems. The use of such forms of work helps students of higher education to form their own environmental protection position, encourages an active response to existing environmental problems, prompts them to find rational ways to solve them, and participate in practical actions in the given field. It is worth emphasizing the fact that the effectiveness of such work was significantly increased under the conditions of the use of regional materials and content, which were well known to the students of education (threats from military actions, non-rational use of natural resources, uncontrolled deforestation, violations of agricultural techniques for growing cultural plants,

anthropological pressure on nature conservation areas and sanitary zones of water bodies, dangerous emissions of nature management subjects, etc.) and involving them in active volunteer environmental activities with further coverage of the work carried out in network systems.

The defining directions of environmental education of adults and students were:

- clarification of the idea of a social refrigerator (filling of the refrigerator should be optimal, namely such as to prevent spoilage of products and to reduce their disposal);
- implementation of the principles of eco-business and eco-behavior (production and household activities must be consistent with the idea of nature conservation, ensuring harmonious relations between the individual and society);
- identification of environmental initiatives (involvement in environmental protection activities, participation in regional environmental projects, practical support of the postulates of the green movement);
- the need for the functioning of an ecological family (the whole family, regardless of age, must adhere to the principles of ecological existence through practical actions).

The specified areas of environmental education determined the manifestation of basic environmental rules in the participants of the environmental educational project:

- refuse to use non-ecological technologies and products;
- reduce consumption, be economical, use restorative practices;
- repair, adapt used materials or products for new use;
- recycle (recycling, upcycling, adhere to the principle of circular economy, provide the opportunity to use waste for environmentally safe processing, disposal or storage);
- compost;
- enjoy the environment, treat it with care.

A productive approach to education for sustainable development proved to be the organization of volunteer activities, such as networking and thematic clean-up quests aimed at reducing pollution in specific areas: «Free the living space from dirt», «Environment Day», «Take care and love your region», «Give a chance to live», etc. Presentations using various network resources served as a form of environmental activity reporting. Therefore, the specified activity was public, which led to an active discussion of environmental actions and the development of further strategies of environmental impact on the environment.

The use of such a form of work as an ecological fair, where students, together with students and their parents, made various products from natural materials turned out to be effective in the implementation of education for sustainable development. The participants of the project with great pleasure created floral arrangements, various products of ecological orientation from natural materials, using pebbles, shells of molluscs, collections

of insects, roots and shoots of plants, cones of gymnosperms, acorns of oak, feathers of birds, etc.

Sorting household waste turned out to be the effective form of the specified activity. Solving this problem required not only clarification, but also coordinated work of communal services and educational institutions. Containers for waste were located directly in the corridors of general secondary education institutions, had an attractive appearance and proper design. Differentiated sorting of glass, plastic, non-ferrous metals, polyethylene products took place every day in front of the participants of the educational process of different age groups and turned out to be extremely instructive. During breaks, senior students provided advisory assistance to younger students regarding the purpose of each container.

## **Conclusions**

Environmentalism serves as the conceptual foundation for the modern sustainable development policies of European Commonwealth countries. The sustainable development strategy encourages the promotion of environmental values, the preservation of ecosystems, and the adoption of resource-efficient technologies. Integrating European environmental education practices into the professional training of natural science teachers will foster ecological consciousness in the younger generation. This consciousness, marked by a high awareness of global environmental threats (political, social, industrial, economic, and military), will drive the implementation of effective methods for their humane resolution. Such awareness is indicative of the development of ecological competence - an integrative quality of a highly motivated individual. This competence is reflected in the individual's environmental education and readiness to harness their personal potential in creative pedagogical activities, enhance their acquired experience, and pursue continuous self-education throughout their life.

In order to develop the environmental consciousness of students of higher pedagogical education, universities should develop their educational and professional training programs taking into account the activity component (use of modern learning technologies, implementation of volunteer environmental protection activities, dissemination of ecologically oriented information in network systems, etc.). It can be argued that sustainable development education requires the development of an effective strategy for its implementation in modern conditions. The priority areas of such activities are the organization of relevant scientific research, which will lead to awareness and adaptation of world experience to Ukrainian realities.

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