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**FOUNDATION OF CONTENTS TEACHING MATERIALS  
ECOLOGIST TRAINING FOR COMPETENCE IN THE CONTEXT OF  
SUSTAINABLE DEVELOPMENT**

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***Abstract.** The paper presents the methodology of the content of teaching materials for future environmentalists for sustainable development taking into account the main production functions and typical problems of activity. There is a new structural and logical scheme of the educational process of preparing future environmentalists presented. Optimized professional and practical training of future environmental experts by strengthening relations with other structural elements of the training content.*

***Keywords:** teaching content, professional competence, education for sustainable development.*

Among the main problems in environmental education and education for sustainable development "are the lack of satisfactory teaching materials, underutilization of capacity of higher education and research institutions, the shortage of skilled educators and insufficient awareness and insufficient development of interagency and multilateral cooperation on Education for Sustainable Development" [6, p.18-19]. This was the impetus for beginning research to develop and improve complex teaching of environmentalists to future professional activity in the transition to sustainable development of society.

**Production problem and ways to solve it.** UNECE Strategy encourages countries to include in the formal education system elements of education for sustainable development (ESD) and determines the priority development programs relevant teaching disciplines. The strategy includes the introduction in the educational process unconventional topics, approaches and methods in order to teach to solve complex social and environmental problems. National Strategy

should focus on the possibilities of interdisciplinary analysis of real situations both by restructuring the curriculum, and by changing teaching methods. For this purpose we have prepared a manual "Workshop to develop local sustainable development strategies" [4].

Summing up the approaches to the formation of theoretical knowledge of the foundations of sustainable development for future environmentalists in the education system we distinguish the following items:

- *theoretical and methodological* framework, based on the analysis of trends in the knowledge of the general laws of complex systems development;
- *didactic principles* of the content structuring of normative disciplines with regard to aspects of sustainable development (such as "General Ecology", "Technical Ecology", "Environmental Monitoring", "Modelling and Forecasting the Environment" and "Sustainable Development Strategy");
- *terms of innovative pedagogical teaching process* of forming knowledge on sustainable development of future environmentalists.

**Discussion of results.** International recommendations on innovative teaching methods and technologies include the following changes in the educational process [10]:

- lectures for large flows should be changed for lessons in small groups (seminars, projects), with emphasis on problem-made oriented education system (*problem/project-based learning*) and mastering practical skills (this is problematic under the current, very limited financing of public higher education institutions);
- maximum orientation of training technologies to information and communication technologies (*e-learning*), wider use of existing online educational tools (*open educational resources*);
- increase independent work under the guidance of teachers, increase the number of individual sessions etc. (focus on classroom hours is inadequate to modern learning requirements).

Such changes in the educational process, along with the modernization of evaluation system could significantly improve the training of future

environmentalists. There is no draft appropriate changes in the system of modern education in Ukraine. No information on changes and the methods and techniques of training in management structure of Ukraine educational system, in particular for the formation of education for sustainable development (still is being formed).

In the transition of society towards sustainable development the goals and objectives of future professional environmentalists vary considerably because of the need to restrain consumer attitude to nature. Particularly relevant is the question in the context of the implementation of the new Sectoral Standard of Higher Education (SSHE) in Ukraine, in particular the production functions for solving typical problems in such activities as "development plans and programs in the field of sustainable natural resources". It should include:

- the ability to calculate local, regional indices and indicators of sustainable development for the analysis of the development level of society;
- capacity to "develop scientifically grounded recommendations to support management decisions in activity" [4, s.42-43]. However, management decisions "are made not only on behalf of the group and for the benefit of the group, but on behalf and for the benefit of posterity" [5, s.118].

According to Educational and Professional Program (EPP) Bachelor 2004 and current OPP Bachelor (2011), on the level of independent regulatory disciplines specific environmental management functions are considered only in such disciplines as "Environmental impact assessment", "Environmental Monitoring" and "Environmental regulation". The same environmental and management functions covered in the 2nd module course "Organization of management in environmental activities" [7, p. 367 ], which includes besides theoretical knowledge in the field of environmental management, a whole block of the legal provision (application forms , time of submission, review and return of documents, etc.). In our opinion, appropriate to transfer all these disciplines to the EPP training education level "master" (in thematic modules subject "Environmental Management"), and for EPP Bachelor of environmental education leave only conceptual elements (purpose, principles, objects and subjects of objects, etc.) [1].

In developing the EPP of future environmentalists teaching it is important to logically link the "master" disciplines with disciplines of "predecessors" and disciplines of "successors".

Block of disciplines that implement competence of control production function is presented primarily by discipline "Environmental Monitoring", in particular, such blocks of content modules like "Monitoring of air", "Monitoring of surface water", "Geological Environment Monitoring", "Monitoring soil", "Monitoring of biological resources" and so on.

Relationship of professional and practical training cycle with the subjects "precursors" will be more effective if the learning of handling environmental information methods is preceded by learning the methods of obtaining such information. These methods should be organized by their nature (physical, chemical, biological) and be made in the form of three blocks of content modules [2] (these modules are presented in the following sequence in developed our textbook "Environmental Monitoring " [3 ]). Thus, the internal optimization of professional and practical training of future specialists in environmental curricula should be accompanied by strengthening of links with other structural elements of the learning content.

In the first stage of developing recommendations on the content of educational, scientific and methodological materials for each base of future environmentalist key competence we identified specific disciplines and relevant substantive competence.

Among social and personal competences on the bachelor level it is necessary to highlight the socio-cultural and socio-labor that should be presented in such disciplines as "Sociology", "Culture", "Politics" and "Safety". This socio-cultural competence must provide the student's ability to organize and conduct specific sociological research, knowledge of the elements of social mobility and the ability to determine the structure and spheres of social subjects. To implement such competence in the discipline "Socioecology" the appropriate blocks of content modules should be provided.

Competence to ensure safe spheres must appear in the Content modules of the discipline "Safety". The contents of disciplines "Sociology" and "Safety" include such important blocks as "Social development" and "Society and Nature" that are well represented in almost all textbooks on these subjects. Socio-personal competencies include the ability to formalize and interpret social and environmental information. This ability is formed by substantive competencies of such subjects as "Higher Mathematics" and "Simulation and prediction of the environment." Thus, content of discipline "Environmental Monitoring" was added with the following blocks of content modules: "Formation Database", "Database Management", "Methods of analysis of monitoring observations " and "Principles and methods of predicting changes in the environment".

On the second stage it was defined the matching of key competencies to the content of the main subjects of educational and professional master's program in the ecologist field of study "Ecology, Environmental Protection and Sustainable Use of Nature".

Among social and personal competencies at Master's level also highlighted the socio-cultural and socio-labor, they include the following competencies:

- awareness of the issue of sustainable development;
- basic knowledge of biosphere and technosphere co-evolution principles;
- ethical behavior;
- systems thinking;
- awareness of the socio-economic development;
- social responsibility for the results of professional decision-making.

According to the structural and logical scheme of the educational process Master's Degree, the implementation of these competencies provides content of such subjects as "Sustainable Development Strategy", "Civil Defense" and "Methodology and organization of scientific research." To improve the consistency of the material to the content of the basic course "Sustainable Development Strategy" the following questions were included:

- formation of system "Society-Nature ";

- features and elements of modern biosphere crisis;
- principles of environmental ethics and environmental education.

Contents of subjects "Civil Defense" and "Methodology and organization of scientific research" should include such competencies as "social responsibility" and "understanding the processes of social and economic development".

Instrumental competence (such as "aquirement of processing methods, storage and dissemination of information", "skills of experimental studies," etc.) have to be ensured by disciplines "Environmental monitoring" and "Methodology and organization of scientific research".

Ability and communication skills in native and foreign languages are formed by each of the sample and standard disciplines in the EPP Bachelor and Master by providing the opportunity to prepare reports, make presentations, abstracts and defend term papers and more. Thus, the teacher must control the ability of the student to briefly retell material (within 5-7 minutes) and properly build the structure of the report and vocabulary of the material.

Skills in computer networks are formed within the discipline "Information and systematology." These skills are fixed by the motivation to find original material in the preparation of independent abstract works in each discipline, writing student papers and more.

*General scientific competence* for almost all specialties of Master training should be provided in teaching all precursor subjects and, first of all disciplines "Higher Mathematics", "Physics" (1 - year) , "Chemistry of the basics of biogeochemistry ", "Soil", "General Ecology " (2nd year) , "Technical Ecology", "Environmental Monitoring", "Landscape Ecology", "Human Ecology" (3rd year) , "Modeling and Forecasting the Environment", "Urboecology" (4th year) and "Methods and Research", "Sustainable Development Strategy (5th year) .

*Professional competence*, in the main, should be ensured by regulatory disciplines of the cycle "natural-scientific, professional and practical training". For example, for specialties 8.04010601 "Ecology and Environment", 8.04010602 "Applied Ecology and Sustainable Nature (industry)" and 8.04010603

"Environmental safety" the professional competences with respect to the ability to identify the sources of environmental impact are provided by precursor subjects of bachelor course " Technical Ecology", "Environmental Monitoring", "Landscape Ecology", etc. Knowledge of basic principles and the principles of state environmental policy and environmental safety should be formed by such disciplines as EPP bachelor "Environmental Security", "Environmental Law", "Environmental Economics" and regulatory professionally oriented disciplines of EPP degree (eg, "Sources of Environmental Hazards" and "Methodology and theory of ecological Safety").

Structural-logical scheme of the teaching process was developed based on subject-activity approach with regard to the main production functions and ensuring their professional mobility by upgrading the educational process and the educational and methodological support. The proposed version of the training content of environmentalists is characterized by decrease the number of subjects and, consequently, decrease the substantial overlap between them [8].

Such structure of the educational process is fully consistent assigned the Ministry of Education and Science of Ukraine recommendations to reduce "the number of subjects of professional and practical training Cycle by combining their content, which is a common subject orientation" (especially in the "Regulations on the ranked education system in Ukraine", approved by the Cabinet of Ministers of Ukraine № 69 dated January 20, 1998).

### **Conclusions**

The approach to content development of training materials and structural logic option scheme of the educational process of future environmentalists training concerns in the main disciplines of mathematical cycle, natural sciences, vocational and practical training. Thus, subjects of humanitarian and socio-economic training cycle should be taught logically connected with related academic disciplines of the first two blocks. In particular, the content of the course "Philosophy" is to ensure the acquisition of social and personal competence as "the

ability to take into account the social relations during their activities" and "ability to conduct sociological research".

The lack in EPP such disciplines as "Sociology", "Politics" and "Jurisprudence" increases the load on the basic discipline "Philosophy" and leads to the need to expand its content with not typical for it educational elements.

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**ОБГРУНТУВАННЯ ЗМІСТУ НАВЧАЛЬНО-МЕТОДИЧНИХ  
МАТЕРІАЛІВ ДЛЯ ПІДГОТОВКИ ЕКОЛОГІВ В КОНТЕКСТІ  
ПЕРЕХОДУ ДО СТАЛОГО РОЗВИТКУ**

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*Анотація.* У статті обґрунтовано зміст навчально-методичних матеріалів для підготовки майбутніх екологів з компетенціями в галузі сталого розвитку. При цьому враховували головні виробничі функції і типові задачі діяльності фахівця. Запропоновано нову структурно-логічну схему навчального процесу підготовки майбутніх екологів. Оптимізовано цикл професійної та практичної підготовки майбутніх екологів шляхом зміцнення зв'язків з іншими структурними елементами змісту навчання.

*Ключові слова:* зміст навчання, професійна компетентність, освіта для сталого розвитку.

# ОБОСНОВАНИЕ СОДЕРЖАНИЯ УЧЕБНО-МЕТОДИЧЕСКИХ МАТЕРИАЛОВ ДЛЯ ПОДГОТОВКИ ЭКОЛОГОВ В КОНТЕКСТЕ ПЕРЕХОДА К УСТОЙЧИВОМУ РАЗВИТИЮ

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*Аннотация.* В статье обосновано содержание учебно-методических материалов для подготовки будущих экологов с компетенциями в области устойчивого развития и с учетом главных производственных функций и типовых задач деятельности. Предложена новая структурно-логическую схему учебного процесса подготовки будущих экологов. Обоснованно внутреннюю оптимизацию цикла профессиональной и практической подготовки будущих специалистов-экологов путем укрепления связей с другими структурными элементами содержания обучения.

*Ключевые слова:* содержание обучения, профессиональная компетентность, образование для устойчивого развития.