

## The Model of Students' Environmental Competence Formation in Pedagogical University

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Paper received 21.03.17; Accepted for publication 02.03.17.

**Abstract.** The main requirements for models in general had been revealed in the article. It was stated that the model is the result of modeling, the ideal example of this process, the achievement of its goal. We understand the modeling of the process of forming the environmental competence of students as the process of identifying typical tasks of future environmental and professional activity and their further transformation into educational and practical tasks. In the process of modeling, the logic construction had been followed on the basis of system integration of the content of environmental and vocational education components, and also taking into account the objective sequence of stages of personal and professional development of a specialist. It was grounded that the model of formation of the students' environmental competence in a pedagogical university includes the target, content, technological and productive units, and is characterized by the availability to implement philosophical, methodological, professional-prognostic (acmeological) and design-technological functions. The target unit includes the goals and objectives of forming the environmental competence of students in the conditions of a pedagogical university, which are closely interrelated with the projected outcome of the process being studied. The content unit includes the content of the educational process and the successive stages of integration of environmental and vocational education. The technological unit includes didactic principles, forms, methods and technologies of students' environmental competence formation. The result of the proposed model is the formed environmental competence of students in the conditions of a pedagogical university. It is stated that the main components of the model interact through feedback mechanisms.

**Keywords:** *model, formation of environmental competence, pedagogical university, modeling process.*

Current pedagogical researches try to project and test the model of environmental education, the competent models of vocational education, the formation of professional competence, the ecologic culture of the students.

Some researchers (A. Kolonkova, N. Kurylenko, N. Pustovit, O. Prutsakova, L. Rudenko, L. Tytarenko, V. Sharko [7, 8, 9]) paid much attention to the problem of formation of environmental competence of future professionals. Scientists believe that environmental competence is manifested in a systematic decision-making to incorporate environmental impacts of ones own activities, exercising some influence on the environment. The basis of environmental competence is environmental knowledge, and experience of practical activity in the environment.

In the interpretation of environmental and occupational competence and eco-oriented activities we rely on monographic studies of A. Ivashchenko, V. Panov, and A. Gagarin [5], where the environmental competence is the quality of the professional competence of a specialist, organizing its ability and willingness to eco-oriented professional activity. We understand eco-oriented professional activity as the activity with eco-practical, environmental, and nature protection goal. The inclusion of the individual into eco-oriented activity is the main factor of environmental education, which allows to use environmental, educational and psychological principles and laws of environmental competence formation of an individual.

The aim of the article is to model the process of forming the environmental competence of pedagogical university students.

According to Yu. Gryshaieva, modeling is a theoretical method based on a generalization, abstraction and idealization of the studied processes. The modeling result is the model which is the analogous to reality, the perfect construction of studied process that has the potential to optimize the object of modeling [3, p.122].

According to O. Novikov, the model is a "subsidiary object selected or converted for educational purposes, and

provides new information about the main subject" [6, p. 89].

Thus, the model is the result of the modeling, an ideal example of this process, which achieves its goal. Modeling of the process of formation of environmental competence of students is the process of identifying common tasks for future environmental and professional activities and their subsequent transformation into educational and practical tasks. During the modeling process we can follow the construction of the logic of the process based on system integration of content of environmental and vocational education components, as well as the objective sequence of stages of personal and professional development of a specialist.

Let us consider the basic requirements that apply to models in general.

The researcher O. Novikov noted that the first requirement to the created model is its inherentism. It is "sufficient degree of consistency between the created model and environment. The model should be consistent with the cultural environment where it is going to function not as a foreign element, but as a natural part" [6, p. 89]. The second requirement is a simplicity of model and the third requirement is its adequacy. Adequacy of the model is aimed at achieving the set of goals in accordance with the criteria and indicators.

Nowadays, there is no single position on universal approaches to educational activities modeling. This is, in our opinion, especially connected with the complexity of modeling object with different factors of personal-centered educational system, with the creative nature of educational activities.

The model of formation of environmental competence of students in educational institutions include targeted, content, technological and efficient units, and is characterized by the capacity to perform philosophical and methodological, professional and prognostic (acmeological) and design-technological functions.

The target unit includes goal and objectives of formation of environmental competence of students in educational institutions, which are closely connected with the projected result of the studied process.

Meaningful unit of the model includes the content of the educational process and the successive stages of the integration of environmental and vocational education. The process of the formation of environmental competence of students lies in a consisted formation of environmental focusing of a personality, her professionally significant qualities that define specific environmental and occupational activity, formation of acmeological invariants of professionalism. It is expressed in a complex of educational modules and programs that are integrated into the process of training. In the frameworks of model's content implementation the following educational programs have been used: "General Ecology", "Ecosystemology", "Ecology of Plants and Animals", "Human Ecology" and the program for extracurricular activities "Environmental Competence of an Individual in Professional Teaching Activity" aimed at environmentalizing of the content of training specialists through projecting of the activity results of professional training (system of comprehensive, general and professional competencies); creation of an ecological educational environment, which is a technology for enriching and expanding the creative potential educational opportunities that student self-selecting and mastering projects their individual educational space (teaching design taking into account the environmental aspect of professional activity, participation in the student scientific society, independent choice of topics and technologies perform creative tasks ecological, etc.). It is also aimed at the creation of an ecological educational environment, that is the enrichment technology and expands the creative potential of the educational opportunities where students can choose and project his own individual educational space (educational projecting taking into account the environmental aspect of professional activity, participation in the student scientific society work etc.). The content of the process of formation of environmental competence of students of pedagogical universities was made based on the formed attitudes about the phenomenon of environmental competence of an individual, its structural and functional components: environmental philosophy, systems of vocational-oriented environmental knowledge, readiness for environmental and occupational activity and environmentally professional reflection.

According to the model of environmental competence of students in educational institutions the stages of integration of environmental and professional education include:

1) acculturation is the process of convergence (in a different sense), compromise, stability, which is the process of initial convergence of environmental and professional education components and creation the components of environmental competence (ideological and motivational, cognitive-reflective, active and practical) as a result of interpenetration of cultural aspects of their content. The result is the formation of environmental and professional focusing of an individual.

Environmental and professional focusing of an individual is the initial qualitative result of environmental and

vocational education (primary convergence of ideological and motivational, cognitive-reflective, active and practical components as a result of its environmentalization). This stage of integration is characterized by the following indices of personal and professional development of a specialist:

- accumulation of environmental knowledge, the need for self-realization through environmental and occupational activities (integration of cognitive-reflective component);

- desire for further training in the field of environmental education (integration of ideological and motivational component);

- ability and readiness for innovative, individual project environmental activity (integration of activity-practical component);

2) co-adaptation is universal and mutual adaptation of objects to conditions that have been changed. It is the process of an individual's adapting the received as a result of acculturation, social and cultural experience to the general education tasks of training. The result of co-adaptation stage is the development of professionally important personality traits that are defined by specificity of environmental and professional activities.

Professionally important (significant) personality traits are certain dynamic properties of an individual, mental and psychomotor properties (expressed by the level of development of relevant processes) and physical qualities that meet the requirements to a man in terms of a certain profession and contribute to the successful mastering of this profession. Professionally important (significant) personality traits is a major factor of professional competence. They characterize certain abilities, and also organically included into their structure, developing in the process of learning and activity [4].

3) synergy is a new emergent quality of system interaction, which is a process and result of updating the values of ecological culture in professional activities. The result of the stage is the formation of acmeological invariants of professionalism (environmental and occupational self-organizing, environmental and occupational self-regulation, environmental and occupational self-development) of future specialist of teaching areas.

Acmeological invariants of professionalism characterize the high level of development of environmental competence of a personality. They are also the qualities and skills (competencies) of a specialist, providing high productivity and stability of environmental and occupational activities.

According to A. Derkach and V. Zazykin [1], acmeological invariants of professionalism, in the general sense, are the main characteristics, quality and professional skills, providing high efficiency and stability of the activity, regardless of its content and specificity. Acmeological invariants of professionalism can also occur in the interior motives that provide targeted development, consistent implementation of creative personality. Scientists distinguish the following types of professional acmeological invariants: a) general acmeological invariants, i.e., do not depend on the specificity of activities and common to all professionals (developed anticipation, high levels of self-regulation, the ability to make effective decisions, high creativity, strong and adequate motivation of achieve-

ments); b) special or specific acmeological invariants that reflect the content and requirements of the relevant professional activities (e.g, high communication skills, stress resistance, etc.).

Acmeological invariants of professionalism are the quality characteristics of professionalism itself in the general sense, as the environmental aspects in the modern world acquire generally global character, defining the indices of the effectiveness of any professional activity without exception.

Technological unit of the model includes the grounding of didactic principles of the process of environmental competence formation of students in educational institutions. Taking into consideration the mandatory compliance of general didactic principles (the training and developmental education; link between training and life; regularity and consistency of training, etc.) in the implementation of the content and mechanisms of conceptual model implementation. The work also includes didactic principles concerning the subject of research: environmental and occupational mobility, culture targeting, project-based approach, modeling of professional activity.

Analyzing the technological principles listed above we come to the conclusion about the necessity of personality-oriented focusing of the pedagogical process, the subjective perception of the student’s individual the relevance of educational interaction implementation to meet the criteria of educational technology. However, according to P. Schedrovitskyi, the above mentioned technological principles of the educational process providing should be added by the reflection and “subject involvement in the decision making process” [10, p. 467].

A famous scientist Yu. Gryshaieva adds the following principles to specific didactic principles of environmental

competence formation of an individual during the contents and mechanisms of conceptual model implementation: environmental and occupational mobility, economic feasibility, culture targeting of environmental education, regional studies principle, interdisciplinary environmental knowledge, providing modular nature of environmental education, its organization based on ecosystem cognitive model, organization of subjective integration process, modeling of environmental and occupational activity [3, p.186].

Technological unit of the model includes methods and technologies of environmental competence formation. We think the most appropriate teaching methods division into three main groups (by Yu. Babanskyi) are: methods of organization and implementation of teaching activity, methods of stimulating and motivation of educational activities, methods of control and self-control for educational activities effectiveness.

Based on the objective tendencies of modern higher education modernization associated with the transition to a competency-oriented model, it is clear that the methodological approaches and technological methods should be aimed at acquiring all types of activities. It makes possible quick rebuilding and adaptation to new conditions in future professional practice. Therefore, forefront of the educational process includes such teaching methods that reflect the personality and activity of pedagogical interaction (in our opinion, projecting and research methods), and methods of problem-modular training based on information and communication educational technologies: problem, concentrated, modular, context, project-based learning, gaming technology, developing training technologies (table 1).

**Table 1.** Methods and technologies of formation of environmental competence of students in pedagogical university

Components	Aim of environmental competence formation	The most effective methods	The most effective technologies
1. Ideologically-value	Values formation	Method of moral values priority; methods of creating a favorable atmosphere, establishing communication; methods of mental activities, methods of exchange activities; method of interactive game	Problem training
	Ideology formation		Game training; developing training
2. Cognitive-reflexive	Formation of the base of environmental knowledge	independent work of students; problem-deductive search	concentrated training; differentiated training
	Formation of consistency of ecological thinking	problem-deductive search; methods of intellectual activity	modular training; differentiated training
	Formation of ability for reflection and self-development	Methods of reflection organizing	Active (comprehensive) training
3. Activity-practical	Formation of a system of environmental skills, technology for interaction with nature	Methods of environmental activity organizing; methods of creating a favorable atmosphere, establishing communication	Developing training; game training; educational projecting
	Formation of experience of emotional and volitional attitude in solving environmental problems on a personal level	Problem-search practices; learning through collaboration; method of interactive game	Context training; differentiated training; educational projecting

Technological unit of the model includes the forms environmental education: lectures, discussions, lectures, conferences, research environmental workshops, student scientific society etc..

In particular, in terms of student scientific ecological society the following forms of educational interaction are implemented: the planned meeting at least once a month;

thematic meetings in the form of “round tables”; organizing and conducting of scientific conferences; preparation of publications of student research articles; participation in environmental competitions, olympiads; preparation and conducting of environmental events, and holidays.

New requirements for educational institution graduate based primarily on practically oriented preparation, so the

methods, forms and technologies used in the educational process should ensure the "inclusion" of the student in the relevant activities. It will ensure the experience gaining, the formation of practical skills and personal attitudes to future professional activity.

Effective unit of the model includes such components as: ideological and motivational, cognitive-reflective, active and practical.

Layered differentiation of the results of environmental competence formation is based on a system of appropriate criteria and indicators: 1) formation of environmental and occupational orientation of the person, whose parameters are: the need for self-realization through environmental and occupational activities; the desire for self-development in the field of environmental education; ability and commitment to innovative, independent project environmental and occupational activity; availability of environmental awareness; 2) formation of professionally significant qualities that are defined by the specificity of environmental and occupational activity, which indicators are: humanity (including empathy); anticipation as the results of environmental and occupational activities; creativity; high motivation of achievement; responsibility for the results of environmental and occupational activities; 3) formation of acmeological invariants of professionalism which main indicators are: environmental and occupational self-development; environmental and occupational self-regulation; environmental and occupational self-organization.

During the theoretical modeling we defined such levels of environmental competence of students of pedagogical universities (high, medium, low) and the corresponding

types (eco-centric formed type, nature-centric formed type and anthropocentric formed type).

The result of the proposed model is formed environmental competence of students in pedagogical university. Model as a perfect sample of standard allows to compare actual results to reach the planned formation of environmental competence with a high level, according to available professionogram. It is confirmed in the works of O. Anisimov, and S. Hlazachev: "Model is needed to focus in rearrangements of specialists' readiness for professional activities and orientation in restructuring of educational mechanism. But this procedure requires "ideal" image of a specialist who does not create new and overcomes the existing environmental problems" [2, p. 8].

Therefore, we have developed a model of environmental competence of students in pedagogical university, which includes targeted, content, technological and efficient units and is characterized by the capacity to perform philosophical and methodological, professional and prognostic (acmeological) and projecting and technological functions. Targeted unit includes goals and objectives of formation of environmental competence of students in pedagogical university, which are closely linked with the projected result of the studied process, a content unit is the content of the educational process and the successive stages of the integration of environmental and occupational education, technology unit is didactic principles, forms, methods and technologies of environmental competence of students. The result of the proposed model is the formed environmental competence in pedagogical university students. The main components of the model interact via feedback mechanisms.

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