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FORMATION OF ECOLOGICAL COMPETENCE OF FUTURE PRIMARY SCHOOL TEACHERS BY MEANS OF ENVIRONMENTAL PROTECTION

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Abstract. *The ecological crisis on a global scale (melting glaciers, explosions at nuclear power plants, pollution of rivers, seas, deforestation, harmful emissions into the atmosphere) requires radical changes in the process of its elimination. Volitional actions related to the cleansing, restoration and preservation of the natural environment are not enough, much emphasis is placed on educating a humane, environmentally conscious population capable of establishing harmonious relations with the natural environment. That is why higher education institutions face an important task – to form the environmental competence of future primary school teachers, to prepare students for the organization of environmental activities in working with younger students as a basis for shaping their environmental worldview. The article analyzes the theoretical foundations of the formation of environmental competence of future teachers, focuses on important summits, meetings, conferences, which rapidly and purposefully promote the preservation of the natural environment, stimulate the education of environmentally conscious younger generation. The aim of the article is to conduct an experimental study and establish the levels of formation of environmental competence of future teachers, based on its results to identify a model of formation of environmental competence of future teachers of higher education.*

In the course of the research we have singled out the main components (motivational, cognitive, activity, reflexive) of the formation of ecological competence of future teachers, as well as the corresponding criteria and levels. We conducted an experimental study to establish the level of environmental competence of future teachers among the leading pedagogical institutions of Ukraine: Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Kamianets-Podilskyi National Ivan Ohiienko University and T.N. Shevchenko National University "Chernihiv Colehium". The study made it possible to complete the model of formation of environmental competence of future primary school teachers by means of environmental

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activities (stages of implementation, priorities, pedagogical conditions, tools, forms). The study outlined new areas for further work.
Keywords: *ecological competence, ecological crisis, future primary school teachers, model of organization of educational process, nature protection activity.*

Introduction

The ecological crisis, from which the whole world suffers, poses a number of priority tasks to humanity, including the preservation, restoration and increase of natural resources; overcoming the consequences of environmental hazards; education of humane ecologically conscious population. All these tasks are of paramount and urgent importance, as they affect the quality of life and health of the population of the entire planet. In this regard, a deep reform policy in the field of ecology and education, special emphasis is placed on the formation of environmental competence of future primary school teachers, because their activities lay the foundations of environmental thinking of students, form an idea of natural behavior and environmental management worldview, empathy for nature. Pedagogical institutions of higher education in Ukraine are looking for effective ways, means, means of forming the environmental competence of future primary school teachers, because it is a complex process. However, we are convinced that participation in environmental activities will optimize it, make it more efficient and focused, because it brings future teachers closer to the natural environment, allows a clear understanding of environmental issues, build their own strategy to combat the environmental crisis. We believe that participation in environmental activities should be implemented during classroom, extracurricular activities, independent work of students and their pedagogical practice.

The aim of the article is to conduct an experimental study and establish the levels of environmental competence of future teachers, based on its results to identify a model of environmental competence of future teachers of higher education.

Research methods: observation of future teachers during the educational process and pedagogical practice, questionnaires, surveys, analysis of creative work, experiment.

Literature review

Domestic scientific and pedagogical experience and the experience of scientists from near and far abroad have become valuable for building an effective model for the formation of environmental competence of future primary school teachers. The Law of Ukraine “On Education” states the need to integrate the educational process for the ecological growth of students. The State Standard of Higher Education in the specialty 013 Primary education for the first (bachelor's) level emphasizes the relevance of environmental competence for future teachers.

Leading scientists made a significant contribution to the formation of ecological competence in Ukraine: K. Guz studied the formation of natural scientific picture of the world (Guz, 2004, p.123), V. Ishchenko researched the process of environmental protection and ecological safety of the population (Ishchenko, 2009, p.20), N. Kazanishena studied the preparation of teachers for ecological education of students (Kazanishena, 2011, p.87), I. Mozul researched the process of preparation of future teachers for the formation of natural science competence of students (Mozul, 2017, p.32), S. Sovhira studied the involvement of future teachers in the organization of environmental activities (Sovhira, 2008, p.54).

A special place in the system of formation of ecological competence of future teachers is given to the contribution of V. Sukhomlinsky, who in his works "School under the blue sky", "100 tips for teachers", "Sun Flower" gave instructions on educating children to care for nature (Sukhomlinsky, 1976).

In the Resolution adopted by the Council of Ministers of the European Union identifies the following priorities for environmental education, namely: raising public awareness of environmental safety; suggested possible ways to overcome environmental pollution, including the education of environmentally humane population; laid the foundations of full, active participation of each individual in preserving the environment (Resolution of Council of Ministers of the European Union). In 1993, the European Parliament stressed the need to introduce an environmental component in all areas of education and to prepare teachers for the environmental education of the younger generation. One of the tasks of the Fifth European Community Environment Program was to integrate environmental policy ideas into all spheres of life (The European Community Programme of policy and action in relation to the environment and sustainable development, 2005). Analysis of the educational policy of Germany, Denmark, Spain, Sweden, Finland and the United Kingdom revealed the fact that in these countries the importance of environmental education to all sectors of the population, special attention is paid to training teachers in environmental education. J. Castéra, P. Clément, F. Munoz, F. Bogner investigated the features of the influence of bachelor's education of future teachers on the formation of key competencies, including environmental attitudes, consciousness, value systems, behavior and more. The authors emphasize that environmental education plays an important role in learning, develops environmental awareness (Castéra, Clément, & Munoz, Bogner, 2018, p. 8). In his research, Forstner-Ebhard draws attention to the course of Green Pedagogy, which is spreading in Europe, and points out that the educational process should provide a holistic view of environmental issues, to form a caring attitude towards the environment (Forstner-Ebhard, 2011, p.123). According to S. Schmidt, the following teaching methods deserve special attention for the implementation of the Green Pedagogy course: problem-based learning, excursions and travel, research, use of media and elements of interactive learning, case studies, and reflective assessment of each task (Schmidt, 2005, p. 18). D. Shepardson believes that the formation of environmental competence

should begin with the study of the environment, understanding the relationships in it, empathy for animate and inanimate nature (Shepardson et al., 2007).

In accordance with the agreement on cooperation between Ukraine and the European Union, a number of agreements of famous conferences and summits were adopted and ratified (Johannesburg Declaration on Sustainable Development, 2002; the United Nations Conference on Sustainable Development, 2012; Tbilisi Communiqué – Educate Today for a Sustainable Future, 2012; UN Summit on Sustainable Development, 2015, etc.), whose priorities were not only radical action to preserve the environment, but also training teachers to educate environmentally conscious people, promoting environmentally sound behavior.

The European Union's environmental policy is aimed at restoring, preserving the environment, biodiversity and minimizing risks to the environment. The European Green Deal aims to make Europe an environmentally safe and convenient continent for the population (Environment Europe). In the course of European integration, Ukraine is trying to bring its educational and environmental policies closer to European standards.

Methodology and organization of the research

From October 2020 to December 2021, we conducted a study aimed at determining the levels of environmental competence of future primary school teachers by means of environmental protection. The research was conducted on the basis of Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Kamianets-Podilskyi National Ivan Ohiienko University and T.N. Shevchenko National University “Chernihiv Colehium”, it was attended by 112 future teachers of specialty 013 Primary education, fields of knowledge 01 Education / Pedagogy.

The main indicators for determining the criteria, goals and levels of environmental competence of future primary school teachers were the knowledge, skills, abilities, practical experience of working with children in the environmental field, internal conscious desire to engage in environmental activities and understanding of the need to improve their skills in this area.

In the course of the research we singled out the components and criteria for the formation of environmental competence of future teachers.

Motivational component.

Criteria: value attitude to their future professional activity; internal motivation for the organization of environmental activities in primary school.

Indicators: desire to engage in pedagogical activities; desire to perform their duties in a highly professional manner; positive attitude to the natural environment; internal need for environmentally sound behavior; the presence of a stable system of environmental motives.

Cognitive component.

Criteria: knowledge of professional disciplines; worldviews of the natural environment.

Indicators: availability of a set of knowledge in professional natural sciences; availability of a set of knowledge in psychological and pedagogical disciplines; formation of a holistic scientific picture of the world; knowledge of methods of teaching natural education and the peculiarities of its implementation in the educational environment of the primary school.

Activity component.

Criteria: ability to productive pedagogical activity; ability to methodically competently organize environmental activities in primary school

*Indicators:*availability of practical skills and abilities to work with children of primary school age; ability to introduce innovative pedagogical technologies in the educational process of pupils; ability to integrate educational subject areas; availability of practical skills to independently provide the educational process; ability to conduct regular and extracurricular work with pupils in the process of environmental activities; ability to carry out ecological education of pupils.

Reflective component.

*Criteria:*ability to creatively organize the education of primary school pupils; reflective analysis of their pedagogical activities.

Indicators: ability to creatively organize the educational process; ability to creative self-development in the process of organizing environmental activities; ability to reflect on pedagogical thinking; ability to build a strategy for the organization of environmental activities in primary school; ability to find ways of self-improvement, self-development, self-education, etc.

In accordance with the identified components, criteria and indicators, we have determined the levels of environmental competence of future teachers:

- *Low* (students' motivation to study is low, they are pragmatic about the natural environment and its needs, have consumer and entrepreneurial motives. Knowledge is fragmentary, incomplete. Future teachers use ready-made lesson outlines, act as passive observers during pedagogical practice; they do not think about further professional growth, do not reflect, do not seek acmeological growth).
- *Average* (future teachers are as positive about the organization of environmental work as they are about other pedagogical tasks. Students have knowledge of professional disciplines, but there are gaps in their scientific picture of the world. It is difficult for future teachers to apply the acquired knowledge in practice. Students have an idea of appropriate environmental behavior, but do not always do so. Future teachers are responsible for the organization of environmental activities in primary school, but can not always implement with younger students all planned. Students are aware of the need for professional growth).

- *Sufficient* (students have a strong motivation to organize environmental work in primary school. Future teachers have in-depth knowledge of psychological and pedagogical, natural sciences, methods of teaching natural education, but there are some minor gaps. Future teachers are happy to conduct science lessons, organize environmental activities. They are aware of their environmental behavior, have a well-established environmental position. Future teachers strive for self-development and self-education).
- *High* (Future teachers have a constant interest in the organization of environmental activities in working with children. Students have deep knowledge of professional disciplines. They have a stable environmental position, valuable environmental orientations, so focused and consciously carry out environmental activities. Students independently develop methodological products (summaries of lessons and extracurricular activities, didactic games, visual aids) for environmental activities. Future teachers feel the need to rethink their professional activities, engage in introspection, self-development).

To diagnose the formation of environmental competence of future teachers, we used such methods and diagnostic techniques as observation, questionnaires (diagnosis of motives for studying the disciplines of natural education) (adapted from the method of G. Kazantseva), diagnostics of pedagogical ability to organize environmental activities of future teachers (according to the adapted method I. Mozul); survey (definition of ecological installations "EkO30" (according to the method of I. Kryazh), "Ways of development" (according to the adapted method of V. Ursky)); solving ecological situations "Strategy of behavior in nature" (by O. Prutsakova and N. Kazanishena); analysis of student work, analysis of pedagogical activities of future teachers during pedagogical practice, etc. We offered these diagnostic methods to students at the ascertaining and final stages of the experiment, the tasks did not change, but the answers at the final stage in the experimental group differed significantly.

Results of the research

The study of the state of environmental competence of students took place in two stages: the first (statement stage) – from October to December 2020 and the second (final stage) – from October to December 2021 at Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, Kamianets-Podilskyi National Ivan Ohiienko University and T.N. Shevchenko National University "Chernihiv Collegium". Students were divided into two groups: experimental (62 respondents) and control (60 respondents).

At the concluding stage of the study, we identified the importance of each component of the formation of environmental competence of future teachers and summarized the results. The final results of the study are presented in table 1.

Table 1 ***Formation of ecological competence of future teachers at the ascertaining stage of the experiment*** *(created by the authors)*

Groups	**Low**	**Average**	**Sufficient**	**High**
Control group	13 (21.7%)	24 (40.0%)	15 (25.0%)	8 (13.3%)
Experimental group	14 (22.6%)	26 (41.9%)	15(24.2%)	7(11.3%)

The obtained results showed that the indicators of both groups did not differ much. Most students were dominated by the average level of environmental competence (experimental group – 41.9%; control group – 40.0%); indicators of sufficient (experimental group - 24.2%; control group – 25.0%) and low (experimental group – 22.6%; control group – 21.7%) levels were almost at the same level. High-level indicators were characteristic of a small number of students (experimental group – 11.3%; control group – 13.3%). With the improvement of the results of the formation of environmental competence of future teachers, we have developed a model (Figure 1).

The model consists of a number of blocks. The aim of the model is the effective formation of ecological competence of future primary school teachers by means of environmental protection. The model consists of a number of blocks. The aim of the model is the effective formation of ecological competence of future primary school teachers by means of environmental protection.

The formation of environmental competence should be based on the following principles of learning: student-centeredness, science and connection with life, the unity of theoretical and practical training, continuity, concentricity, integration.

Formation of ecological competence of future teachers should be carried out through the following stages: value-motivational (formation of sustainable motivation and value orientations to study a set of disciplines of teaching methods of natural education), semantic-cognitive (formation of ability to search, analyze, rethink, compare information), procedural-activity (formation of the ability to use the acquired knowledge in the organization of environmental activities), creative-reflexive (ability to creatively apply the acquired knowledge in practice, finding ways of self-education).

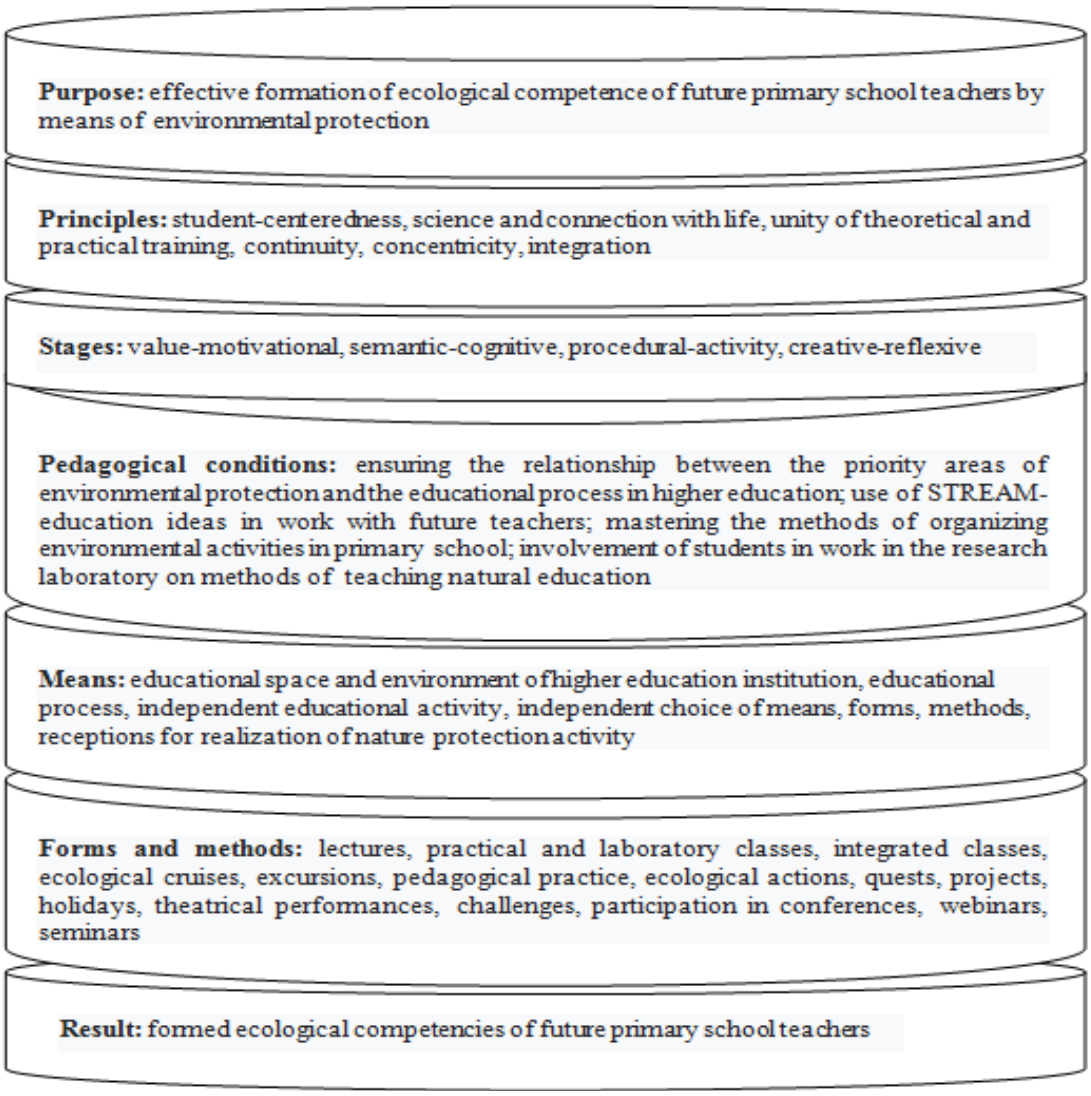

Figure1 ***Model of formation of ecological competence of future primary school teachers*** *(created by the authors)*

In the course of the research we singled out the following pedagogical conditions. The first condition – *ensuring the relationship between the priority areas of environmental protection and the educational process in higher education.* Create a favorable educational space for environmental activities, encourage future teachers to find new ways to solve environmental problems; to create quasi-professional situations for students to acquire professional skills in the organization of environmental activities in working with younger students. The second condition – *use of STREAM-education ideas in work with future teachers.* STREAM-education (acronym Science, Technology, Reading + WRiting, Engineering, Art, Mathematics). Scientists K. Krutii & I. Stakhova argue that STREAM education is a new integrative approach to the education of future teachers. The use of STREAM-education ideas allows to form a holistic and complex scientific picture of the world of the future teacher (Krutii & Stakhova, 2018, p. 391). Forming environmental competence, the teacher should

offer students new productive knowledge, use innovative technologies, encourage future teachers to express their opinions, develop environmental measures with younger students, clearly build an algorithm for environmental protection in primary school and calculate its results mathematically and competently. through the works of artists, empathize with the environment. The third condition – *mastering the methods of organizing environmental activities in primary school.* It is important for a teacher to have interactive technologies and appropriate techniques ("Brainstorming", "Associative Bush", "Openwork Saw", "Carousel", "Fish Bowne", "Two – Four – All Together", "Teaching – Learning", "Circle of ideas", "Loan position", "School of Thoughts", "Debate", etc.) for a better understanding of the problems and the state of the environment); information and communication technologies to illustrate educational material, create animated environmental products (e-books, booklets, websites, blogs, cartoons); project technologies (for the creation of environmental projects), game technologies (for the interest of younger students in environmental activities), etc. The fourth condition – *involvement of students in work in the research laboratory on methods of teaching natural education*. Such a laboratory can be organized in the auditorium of any educational institution and filled with appropriate equipment. In our opinion, such a laboratory must have a corner of wildlife, located taking into account the peculiarities of life of all its inhabitants (plants, animals, reptiles, insects, etc.). Also, the laboratory for methods of teaching natural sciences may contain a set of literary sources (scientific, methodological, periodicals, recommendations) that will help future teachers to fully understand the whole world of science. Poetic works of famous writers and poets, reproductions of paintings by famous artists, audio recordings of musical works by composers, schemes, posters, tables, models of environmental issues can be added to the created library. Laboratory of methods of teaching natural education provides for the presence of a center for experiments, practical work, project tasks. One of the components of the laboratory can be an exhibition of student works (natural history notebooks, encyclopedias, dictionaries, calendars, crossword puzzles, scanwords for junior high school students in science, etc.).

The following tools can be used to form the environmental competence of future teachers: educational space and environment of higher education institution, educational process, independent educational activity, independent choice of means, forms, methods, receptions for realization of nature protection activity.

In the process of forming the environmental competence of future teachers, we offered lectures, practical and laboratory classes on: "Environmental problems of Ukraine and the world", "Directions of environmental education of primary school children", "Features of environmental activities in working with primary school students", "Environmental activities as a means of educating the careful attitude of younger students to the natural environment"; ecological trails "Step to meet nature", "Nature is our home"; excursions to the park, forest, pond,

botanical garden, zoo, terrarium; quests: "The Magic World of Nature", "Vinnytsia"; training practices, field meetings; ecological actions "Save the planet", "Save your home", ecological auctions "Help animals in winter", "Plant your tree", etc.; webinars "Tips for teachers on environmental protection of students", "Environmental education of students", etc.

Using the proposed model, it is possible to achieve effective results in the formation of environmental competence of future teachers. Proof of this is the final stage of the study, which was launched in October 2020. From October 2020 to October 2021, the model of formation of ecological competence proposed by us was implemented in the educational process of students of the experimental group, and future teachers of the control group studied according to the usual curricula. Due to the COVID-19 pandemic and blended learning, some forms of work for the students of the experimental group were conducted online, but their goal was fully realized. The results of the final stage of the experiment are presented in table 2.

Table 2 ***Formation of ecological competence of future teachers at the final stage of the experiment*** *(created by the authors)*

Groups	**Low**	**Average**	**Sufficient**	**High**
Control group	11 (18.3%)	22 (36.7%)	17 (28.3%)	10(16.7%)
Experimental group	5 (8.1%)	27 (43.5%)	18(29.1%)	12(19.3%)

The obtained results showed that the indicators of the experimental group qualitatively exceeded the indicators of the control group at the final stage of the experiment, so the low level of environmental competence was characteristic of 18.3% of students in the control group and 8.1% of the experimental group; the average level was 36.7% of future teachers of the control group and 43.5% of the experimental group; a sufficient level was typical for 28.3% of students in the control group and 29.1% of the experimental group; a high level was characteristic of 16.7% of the control group and 19.3% of the experimental group.

The obtained results showed that the low rate of formation of environmental competence decreased in the students of the experimental group at the final stage of the experiment by 14.5%, while the rate of the control group by only 3.4%; the average of the experimental group increased by 1.6%, while the control group decreased by 3.3%; the indicator of sufficient level in the experimental group increased by 4.9%, and the control group by 3.3%; the high level in the experimental group increased by 8.0%, and in the control group by only 3.4%. Comparative analysis of student performance at the ascertaining and experimental stages of the experiment is presented in figure 2.

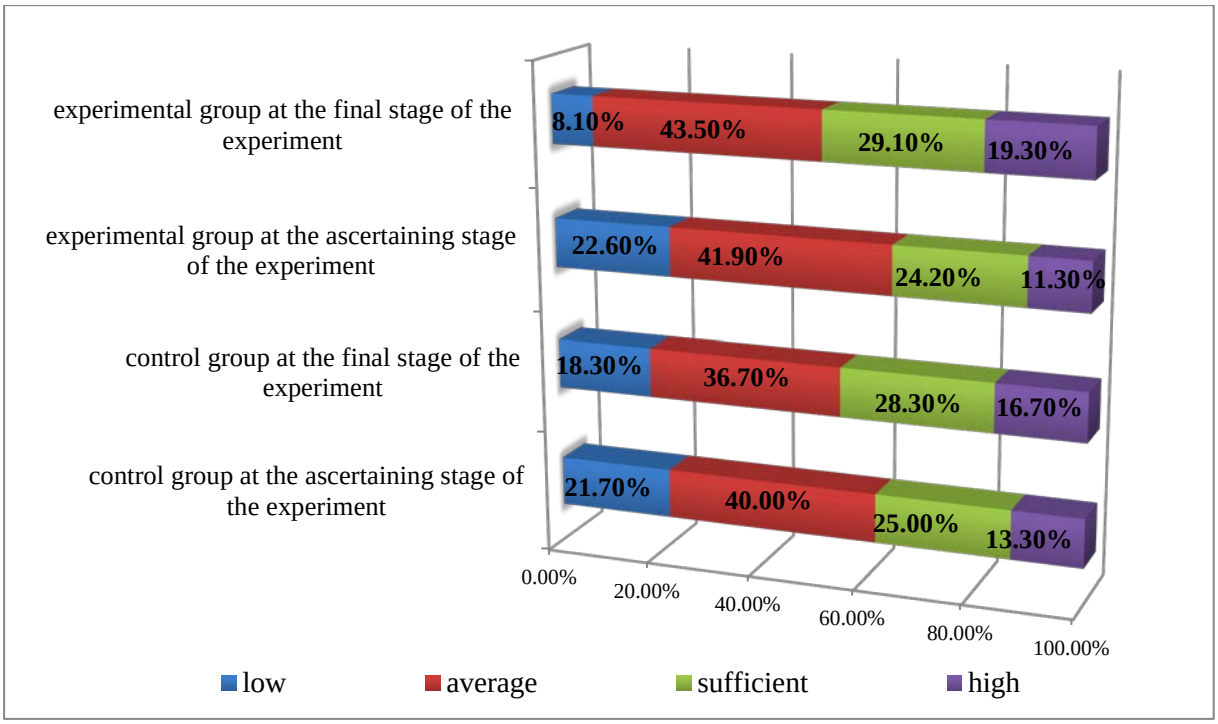

Figure2 ***Comparative diagnosis of the levels of formation of environmental competence of future teachers*** *(created by the authors)*

The obtained results showed that our proposed model of forming the readiness of future teachers to form the environmental competence of future teachers is effective.

Conclusions

The formation of environmental competence of future teachers is a complex process that is relevant to the entire planetary community. It has been studied by domestic and foreign researchers, this issue has been repeatedly raised at European and world summits, conferences and seminars. Ecological competence of a teacher is the ability to effectively apply the acquired knowledge, skills, acquired experience in order to humane environmental education of students. Participation in environmental activities (actions, trails, quests, patrols, seminars, conferences, etc.) will help to quickly understand environmental problems, will stimulate the search for solutions to solve them.

We have developed a model for the formation of environmental competence of future teachers by means of environmental protection. It consists of the basic principles of teaching, stages, pedagogical conditions, tools, forms and methods. We proved its effectiveness in an experimental study, which consisted of two stages – a statement and a final one. The results obtained by the experimental group exceeded the results of the control group at the final stage of the experiment. Thus, we can say that by implementing our proposed model in the educational

process of future teachers can increase their environmental competence, and this will be the basis for the education of a humane conscious population.

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