

## ECOLOGICAL EDUCATION AND ITS RELATIONSHIP WITH STUDENTS' HEALTH

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### ABSTRACT

**The aim** is to assess the state of ecological education in student youth and determine its relationship to the level of students' health.

**Materials and methods:** The research was conducted on the basis of the Polissya National University (Zhytomyr, Ukraine) and the Sumy State Pedagogical University named after A.S. Makarenko (Sumy, Ukraine) in 2018–2020. The ascertaining experiment, which was conducted to assess the state of ecological education of students according to the questionnaire developed by us involved 503 students. The formative experiment aimed at studying the relationship between the level of ecological education and the level of students' health involved 59 students.

**Results:** The ascertaining stage of the experiment showed that the vast majority of students of different specialties revealed a low level of mastery of the components of ecological education. The formative stage of the experiment showed that the EG students significantly improved the level of all components of ecological education, as well as the level of their health ( $p < 0.001$ ). No significant changes were revealed in the CG ( $p > 0.05$ ).

**Conclusions:** The research showed that purposeful work on the formation of ecological education in the process of fitness and health recreation activities has a positive effect on all its components (knowledge, character building, worldview, culture) and the level of students' health. In general, it will help to improve the efficiency of the educational process of students, improve indicators of their life-sustaining and future professional activities.

**KEY WORDS:** ecological education, environmental factors, physical education, health, students

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### INTRODUCTION

Today, students face a difficult task that consists in making radical changes in their consciousness and behaviour, forming and voluntarily accepting the restrictions and prohibitions dictated by the laws of nature. Fundamental changes are also needed in the education system, its values and ways of life, taking into account the environmental, economic, political, social and spiritual needs of today. Therefore, one of the ways to improve the efficiency of the educational process in physical education, the quality of sporting and mass participation as well as fitness and health recreation events including maintaining the health of student youth is to involve the issues of environmental education in the curriculum of physical education in higher educational institutions (HEI) of Ukraine, which should provide students with a system of knowledge about the positive and negative impact of environmental factors on human life and activities; to provide recommendations for exercise and sports in a polluted environment, including various temperature factors, polluted air, water, food, etc.

Excessive technological load on the environment; too slow implementation of waste-free processes; the lack of a unified environmental policy has led to the fact that much of Ukraine is in a zone of environmental disaster. This, in turn, has worsened human health, reduced life expectancy and fertility, increased the risk of poisoning from the polluted environment and the probability of consuming unsafe food i. e. the problems caused by technology-related changes in the transformation of the biosphere. These problems are called environmental, the responsibility of solving which is now laid upon the state [1, 2, 3].

Individual elements of the environment that interact with the human body are called environmental factors. Any environmental factor can be perceived by the human body positively or negatively, depending on the dose of exposure. Each person has his own optimal dose of a factor [4, 5]. The life-sustaining activities of the human body is in a continuous dynamic relationship with environmental factors. This interaction should not disrupt the adaptive mechanisms of the human body. Unconditional and conditioned reflexes are created in the human body

under the influence of various stimuli of his internal and external environment, which determine the maintenance of dynamic balance based on the exchange of substances and energy between the body and the environment [6, 7].

Environmental factors must have a positive effect on health and ensure the normal course of all human life processes. Environmental factors are divided into three groups according to their nature: 1) abiotic ones stipulated by the influence of inanimate nature (temperature, solar radiation, light, water, wind, precipitation, relief, etc.); 2) biotic ones i. e. the influences of wildlife and all relationships with it; 3) anthropogenic ones i. e. the influences caused by human activities [8, 9].

Environmental factors have a very complex physico-chemical composition, including temperature, pressure, humidity, air movement, electric and magnetic field, radiant energy, chemicals released into the air by plants, and so on. Environmental factors affect all receptors and the body as a whole due to such a complex structure. The vastness and generalization of their action is explained by the involvement of various levels of structural and functional organization in the reaction i. e. from molecular and cellular to organ and organism related ones, from peripheral nerve centres to the psycho-emotional sphere of a human being [10, 11].

The above gives grounds to ascertain that the effectiveness of educational and professional activities and in general the life of students should be based on the perception and analysis of information about the characteristics of the environment in which these activities takes place.

## THE AIM

The aim is to assess the state of ecological education in student youth and determine its relationship to the level of students' health.

## MATERIALS AND METHODS

*Research participants.* The research was conducted on the basis of the Polissya National University (PNU, Zhytomyr, Ukraine) and the Sumy State Pedagogical University named after A.S. Makarenko (SSPU, Sumy, Ukraine) in 2018-2020. The ascertaining experiment, which was conducted in 2018, involved 503 third and fourth year students of these higher educational institutions from different faculties: law, public administration and national security; economics and management; engineering and energy; forestry and ecology; accounting and auditing; veterinary medicine as well as agronomic and technological one and other faculties in various specialties. Assessment of the state of ecological education of students was carried out according to the questionnaire developed by us (Appendix I), which contained questions in four blocks: ecological knowledge (6 questions), ecological character building (3 questions), ecological worldview (3 questions), and ecological culture (4 questions).

A questionnaire created by the authors of this article was used for the survey in accordance with the requirements of

the Codes of Ethics of PNU and SSPU. The questionnaire contains 16 questions and is aimed at studying of the state of ecological education of student youth. The questionnaire was assessed by the experts in this field (8 professors and 11 associate professors) and was approved by the Academic Council of PNU (Protocol No. 12 dated 18.08.2018) and SSPU (Protocol No. 12 dated 29.08.2018). Consent to voluntary participation in the survey was obtained from all the students involved in the study.

The completeness of the disclosure of the issue, integrity, logical sequence and knowledge were taken into account when performing written tasks. The results were assessed on the unified 100-point scale according to the current system of comprehensive assessment of students' knowledge in universities, in order to stimulate planned and systematic educational work. 90-100 points – the student shows personal creative abilities, is able to acquire knowledge independently, finds and processes the necessary information without the help of the teacher, is able to use the acquired knowledge and skills to make decisions in unusual situations, convincingly argues answers, independently reveals his own talents and inclinations. 82-89 – the student has excellent skills in the studied amount of material, applies it in practice, freely solves exercises and problems in standard situations, and independently corrects mistakes the number of which is insignificant. 75-81 – the student is able to compare, summarize, systematize information under the guidance of the teacher; as a whole is able to apply it independently in practice; to control his own activities; to correct mistakes that include significant ones, to choose arguments to confirm opinions. 64-74 – the student reproduces a significant part of the theoretical material, shows knowledge and understanding of the basic provisions; can analyse the educational material with the help of the teacher, correct mistakes that include a substantial number of significant ones. 60-63 – the student masters the educational material at a level higher than the elementary one, a significant part of it is reproduced at the reproductive level. 35-59 – the student masters the material at the level of individual fragments that make up a small part of the study material. 1-34 – the student masters the material at the level of elementary recognition and reproduction of individual facts, elements and objects.

The experimental ( $n = 28$ ) and the control ( $n = 31$ ) groups were created from the first year students of the PNU of the Faculty of Technology in order to conduct a formative pedagogical experiment. The formative experiment was conducted during 2019–2020, which introduced the issue of ecological education formation in students in the process of their physical education as well as fitness and health recreation events. The purpose of the formative pedagogical experiment was to find out the relationship between the students' ecological education and their level of health. The level of the students' physical health was assessed according to the method of H. L. Apanasenko [12].

One of the ways to improve the efficiency of the educational process of physical education, the quality of sporting and mass participation as well as fitness and health recre-

**Table I.** Indicators for assessing the state of ecological education of students (n = 503, points)

| Specialties   | Structural components of ecological education |                               |                      |                    | Overall rating |
|---|---|-------------------------------|----------------------|--------------------|----------------|
|   | Ecological knowledge                          | Ecological character building | Ecological worldview | Ecological culture |                |
| Veterinary hygiene, sanitation and expert investigation | 66.4  | 66.1                          | 70.3                 | 71.6               | 68.6           |
| Technology and processing of livestock products         | 63.6  | 61.2                          | 68.4                 | 59.6               | 63.2           |
| Ecology   | 64.8  | 65.3                          | 67.9                 | 43.2               | 60.3           |
| Veterinary medicine                                     | 51.3  | 59.8                          | 56.4                 | 67.5               | 58.8           |
| Law   | 45.8  | 67.2                          | 47.4                 | 56.7               | 54.3           |
| International economic relations                        | 53.2  | 57.9                          | 55.6                 | 49.7               | 54.1           |
| Horticulture and viticulture                            | 47.1  | 56.2                          | 53.5                 | 53.4               | 52.6           |
| Plant protection and quarantine                         | 57.1  | 51.7                          | 53.9                 | 46.2               | 52.2           |
| Forestry  | 45.8  | 52.4                          | 53.7                 | 56.5               | 52.1           |
| Geodesy and land management                             | 53.4  | 49.7                          | 51.7                 | 47.8               | 50.7           |
| Agronomy  | 46.5  | 42.4                          | 52.5                 | 36.8               | 44.6           |
| Public administration                                   | 42.6  | 45.8                          | 44.3                 | 41.2               | 43.5           |
| Agricultural engineering                                | 44.5  | 41.3                          | 51.8                 | 35.8               | 43.4           |
| Industry engineering                                    | 39.5  | 40.6                          | 43.7                 | 38.5               | 40.6           |
| Management  | 37.7  | 43.4                          | 44.6                 | 33.9               | 39.9           |
| Economy   | 38.4  | 40.1                          | 40.8                 | 35.5               | 38.7           |
| Information systems and technologies                    | 38.3  | 40.2                          | 41.6                 | 31.7               | 38.0           |

ation events and maintaining the health of student youth included the introduction of the issues of ecological education in the curriculum of physical education of students, which provided students with knowledge of positive and negative impact of environmental factors on the state of human life-sustaining activities; provided recommendations for exercise and sports in a polluted environment, including various temperature factors, polluted air, water, food, etc. Three main issues were addressed: 1) to form the purpose of ecological education in physical education; 2) to determine the content and hierarchy of tasks of ecological education and character building in the field of physical culture and sports; 3) to substantiate the principles of implementation of ecological education and character building within the system of physical education of students.

**Research methods:** analysis and generalization of the scientific and methodological literature (29 sources on the topic of the article from the scientometric databases PubMed, Scopus, Web of Science Core Collection and others were analyzed), questionnaire survey, pedagogical observation, testing, pedagogical experiment, methods of mathematical statistics. The authenticity of the difference between the indicators of students of studied groups was determined by Student's t-test.

**Ethics.** The research was performed in accordance with the requirements of the Regulations on the system of academic honesty in educational and scientific activities of PNU (Protocol of the Academic Council No. 2 dated

18.02.2018) and SSPU (Protocol of the Academic Council No. 12 dated 18.06.2020).

## RESULTS

It is established that the issues of ecological education and character building of students in European countries are of great importance. The most typical tasks that unite the views of most educationists in European countries on ecological education are: the formation of knowledge about the relationships patterns of natural phenomena, the unity of animate and inanimate nature, the interaction of a human being, society and nature; education of motives, needs and skills of ecologically expedient behaviour and activity, healthy way of life, desire to vigorous activity concerning protection of environment; development of intellectual and emotional spheres of students' psyche on the basis of causal analysis of ecological situations and emotional pain in relation to nature.

The multi-level system of environmental monitoring that exists in Ukraine makes it difficult to obtain and use the information needed by students to maintain health and safe life-sustaining activities. Therefore, most environmental monitoring issues are solved by departmental organizations that deal with their special tasks, which makes it very difficult for students to get a single picture of the state of pollution of the environment in which physical education sessions as well as various fitness and health recreation

**Table II.** Comparative analysis of the level of ecological education in the first and the fourth year students of the Faculty of Ecology of the PNU (n = 92, points)

| Structural components of ecological education | First year students (n=49) | Fourth year students (n=43) | Difference |
|---|----------------------------|-----------------------------|------------|
| Ecological knowledge                          | 65.9                       | 78.5                        | 12.6       |
| Ecological character building                 | 67.1                       | 78.9                        | 11.8       |
| Ecological worldview                          | 68.4                       | 79.6                        | 11.2       |
| Ecological culture                            | 47.6                       | 74.8                        | 27.2       |
| General level                                 | 62.3                       | 78.1                        | 15.8       |

**Table III.** Dynamics of the components of ecological education and the level of health of the EG and the CG students during formative pedagogical experiment (n = 59,  $X \pm m$ , points)

| Investigated indicators       | EG (n = 28)   |              | Significance of the difference |        | CG (n = 31)   |              | Significance of the difference |       |
|-------------------------------|---------------|--------------|--------------------------------|--------|---------------|--------------|--------------------------------|-------|
|                               | Before exper. | After exper. | t                              | p      | Before exper. | After exper. | t                              | p     |
| Ecological knowledge          | 38.6±1.17     | 77.4±3.74    | 9.87                           | <0.001 | 39.2±1.24     | 44.1±2.76    | 1.62                           | >0.05 |
| Ecological character building | 42.3±1.67     | 74.9±2.64    | 10.44                          | <0.001 | 41.5±1.75     | 47.2±2.34    | 1.95                           | >0.05 |
| Ecological worldview          | 43.7±1.87     | 76.9±2.94    | 9.53                           | <0.001 | 42.2±1.67     | 48.3±2.73    | 1.91                           | >0.05 |
| Ecological culture            | 36.4±1.14     | 53.8±1.83    | 8.07                           | <0.001 | 38.1±1.19     | 43.1±2.33    | 1.91                           | >0.05 |
| Physical health level         | 3.14±0.72     | 9.77±0.67    | 6.74                           | <0.001 | 3.29±0.68     | 5.05±0.64    | 1.88                           | >0.05 |

events, sports and entertainment activities are conducted. There is no organization and state program of environmental monitoring in Ukraine at the present moment, which would carry out comprehensive, systematic control over all types of environmental pollution and provide up-to-date information on vital activity security. There are also many issues regarding the unification of departmental regulations on the use of environmental resources. At the same time, many specialties the students study at totally do not raise environmental issues, the study of the impact of environmental factors on human health, and so on. Our monitoring of the quality of ecological education of the third and the fourth year students of the PNU and the SSPU of different specialties showed different levels of students' mastery of the components of ecological education, which is directly related to maintaining students' health, environmental behaviour, the use of natural factors in order to improve efficiency, healthy nutrition, etc. (Table I).

The content of ecological education is based on a system of scientific knowledge that reflects the natural and scientific, social and economic, legal, moral and ethical, technical and ideological aspects of the existence of the natural environment and conditions of life-sustaining activities. In our research, ecological education of students was assessed on four indicators: ecological knowledge, ecological character building, ecological worldview and ecological culture.

*Ecological knowledge* as a component of environmental education is a holistic structure and consists of cognitive and active elements of learning. Cognitive elements include ecological knowledge and the formation of the inner culture of the individual, which will contribute to the har-

monization of human relations with nature. All this helps the student to realize his place in nature and to clarify his responsibility towards it. The student has the opportunity to establish a harmonious relationship with nature on this basis. The main directions of ecological education are: education in the spirit of general ideas of environmental protection and human health, acquisition of special professional knowledge about the general laws of existence of natural and anthropogenic ecosystems.

*Ecological character building* forms an active environmental viewpoint of the student, which is achieved through a set of environmental and ecological education, promotion of environmental behaviour. The main function of ecological character building consisted in the acquisition and accumulation by students of experience of interaction with the environment at the cognitive, sensory and emotional as well as normative levels. It is the combination of knowledge, emotional experiences and practical skills in environmental activities that allows students to make the right decisions during their stay in the natural environment.

We defined the *ecological consciousness* of the student as an organic combination of ecological knowledge, thoughts, ideas, beliefs, feelings, and aspirations. Ecological consciousness was realized in purposeful and meaningful nature protection human activities, active defence of moral values and ecological principles. Thus, ecological knowledge is the basis for the formation of ecological consciousness of the student.

The main means of forming the *ecological culture* of students was a purposeful system of ecological education, which formed the attitude towards nature, determining the allowable degree of its transformation, mastering specific

socio-natural patterns and norms of behaviour in which further human existence is possible. To develop a strategy for the formation of ecological culture, we have created and implemented new approaches and methods of ecological education (ecologization of physical education); singled out the basic qualities of the ecologically educated personality and a technique of his step-by-step formation; correlated the content of education with the real needs and interests of students; applied ecological knowledge in physical culture and health-improving activities of students.

All this helps the student to realize his place in nature and to clarify his responsibility towards it. The student has the opportunity to establish a harmonious relationship with the environment on this basis. The obtained data confirmed the opinion that the inclusion of ecological education in physical education curriculum will significantly improve the ecological education of the individual.

It was found that students majoring in veterinary hygiene, sanitation and expert investigation showed the highest level of ecological education (68.6 points), technology and processing of livestock products (63.2 points), ecology (60.3 points), veterinary medicine (58.8 points), law (54.3 points), international economic relations (54.1 points). This indicates that these specialties are directly related to ecology, hygiene, sanitation, expertise, international attitude to ecological problems of mankind, practical attitude to environmental problems and certain practical skills as future professionals. At the same time, a large number of specialists trained at Ukrainian universities do not study the problems of the impact of the environment on human health and life-sustaining activities at all.

In addition, we conducted the comparative analysis of the level of ecological education in the first (at the end of the academic year) and the fourth year students at the Faculty of Ecology, where ecological education is the basis of their future professional activities. The analysis showed a very significant difference between the comparison contingents (Table II). The fourth year students significantly improved their indicators in all comparative components of ecological education. The research showed that the study of environmental special disciplines helps to improve the knowledge needed both to improve the students' own health and in general to improve their life-sustaining activities as well as future careers.

Therefore, we believe that the inclusion of ecological education in the work programs on physical education will significantly improve the level of ecological education of students of other faculties, where special environmental disciplines are not studied, which will generally improve their life-sustaining activities and health. The conducted pedagogical formative experiment with the second year students of the Faculty of Technology of the PNU showed that the purposeful formation of ecological education has a positive effect not only on the level of ecological knowledge, but also on improving the state of health and reducing the number of students assigned to a special medical group (Table III).

The research confirmed that purposeful work on ecological education in the process of fitness and health recreation activities has a positive effect on all indicators of

students' life. Thus, the EG students significantly improved the level of all components of ecological education, as well as the level of their health ( $p < 0.001$ ). At the same time, no significant changes were revealed in the CG ( $p > 0.05$ ). Moreover, at the end of the experiment, the EG students showed a significantly better level in all studied indicators ( $p < 0.001$ ), compared with the CG, which indicates the effectiveness of the introduction of ecological education to physical education of students of higher educational institutions. In addition, the number of students of the special medical group decreased from 8 to 7 persons in the EG during the pedagogical experiment, on the contrary, its number increased from 7 to 9 persons in the CG.

## DISCUSSION

The organization of the educational process of student youth living in a polluted environment requires special attention to the formation of ecological education. The reason for this is: 1) lack of ecological knowledge of teachers of physical education departments; 2) inadequate material and technical base for conducting recreational and health-improving as well as preventive physical exercises; 3) inadequate medical examination, control over the health of young people and the environment; 4) reduced number of hours devoted to physical education as well as sporting and mass participation, fitness and health recreation events; 5) unsystematic control over physical development, mental and physical performance; 6) lack of scientific recommendations for physical activities in a polluted environment; 7) non-compliance with the requirements for the peculiarities of nutrition in a polluted environment; 8) lack of knowledge, skills and abilities of students on behaviour in the natural environment during sporting and mass participation as well as fitness and health recreation events, leisure and relaxation, etc. [1, 3, 13-17].

The main tasks of ecological education of students in the process of their physical education should be: preservation of a viable natural environment; radical restructuring of ecological education and character building of the individual on scientific principles; formation of a new ecological thinking and worldview in the relationship between man, society and nature; development of ecological education taking into account national heritage, formation of ecological thinking not only in narrow national, but also in planetary aspect; promotion of ecological education, which serves to improve the individual, his inner world, develops human dignity, humanism; human self-consciousness as a part of nature, connected with numerous inseparable ties, which allows to build adequate relationships with the environment [2, 3, 8, 18-21].

It is established that theoretical knowledge on ecology became the basis for activating the consciousness of students and determined the level of their needs for environmental safety. Assimilation of theoretical knowledge stimulated students to analyse facts, their generalization and conclusions, intensified their ability to retrospectively search for information, its systematization, analysis and synthesis, accumulation of individual environmental information experience. In addi-

tion, mastering the theoretical material attracts students to learn about the values of ecological education and character building, develops and forms the cultural potential of the student's personality, expands his worldview.

Ecological character building, which is provided during physical education sessions, is designed to form an active environmental viewpoint of the student, which is achieved through a set of environmental and ecological education, promotion of ecological behaviour. The main function of ecological character building is to acquire and accumulate students' experience of interaction with the environment at the cognitive, sensory-emotional and normative levels. It is the combination of knowledge, emotional experiences and practical skills in environmental activities that allows students to make the right decisions during their stay in the natural environment. The results of our research do not completely solve the problem, they only expand the results of research by other scientists [22-29].

## CONCLUSIONS

1. The analysis of the quality of ecological education of the third and the fourth year students of the PNU and the SSPU of different specialties showed the insufficient level of students' mastery of the components of ecological education. Sufficient and satisfactory level of ecological education was shown only by the students whose future professional activities within the educational process is associated with the issues of ecological education (veterinary hygiene, sanitation and expert investigation, technology and processing of livestock products, ecology, veterinary medicine, international economic relations). At the same time, a large number of students of the higher educational institutions of Ukrainian do not study the problems of the environment impact on human health and life-sustaining activities at all.
2. It is established that the purposeful formation of ecological education in students during their physical education has a positive effect not only on the level of ecological knowledge, but also on improving the state of their health and reducing the number of students assigned to a special medical group. At the end of the pedagogical experiment, the level of all components of ecological education, as well as the level of health of the EG students significantly improved ( $p < 0.001$ ). At the same time, no significant changes were revealed in the CG ( $p > 0.05$ ). Moreover, at the end of the experiment, the EG students showed a significantly better level in all studied indicators, compared with the CG ( $p < 0.001$ ).
3. Ecological education today is recognized as a priority in the character building of student youth, the formation of such patterns of behaviour in the natural environment that reproduce ecological development. The creation of a new paradigm of ecological education requires the reflection and disclosure of its content, forms and methods in all academic subjects. Therefore, one of the ways to improve the effectiveness of the educational process in physical education, the quality of sporting and mass participation as well as fitness and health recreation events and main-

taining the health of student youth is the inclusion of ecological education issues in physical education curricula of the higher educational institutions of Ukraine, which should provide students with knowledge of the positive and negative impact of environmental factors on the life-sustaining activities of students; provide recommendations for exercise and sports in a polluted environment.

**Prospects for further research** are aimed at improving the curriculum in physical education, taking into account the ecological policy of Ukraine and the world community.

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*The Authors declare no conflict of interest.*

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## Appendix I

### Questionnaire

for assessing the state of ecological education in student youth

Dear student!

In order to study and assess the state of ecological education of student youth, we ask you to sincerely answer the questions without missing any of them. Answer the questions clearly, concisely and specifically. Our assessment of your answers will allow us to prepare guidelines to protect your health from the negative effects of environmental factors. It is your level of knowledge on ecological issues that will help us build a methodology for ecological education in the process of physical education. Your answers will be used in a generalized form for scientific purposes only. Please answer all questions as accurately as possible. We hope for your responsibility, we are sincerely grateful to you in advance.

#### 1. General data

Please provide some information about yourself (underline as applicable):

- Last name, first name \_\_\_\_\_
- gender: male, female
- the year of your training: ▪ 1st ▪ 2nd ▪ 3rd ▪ 4th
- which educational division do you belong to: special medical, basic, sports
- age of completed years: 17 years old, 8-20, 21 and more
- Your place of residence: village, town, city

#### 2. Assessment of ecological knowledge

1. Define ecological education.
2. Explain the content of ecological education.
3. List the tasks of ecological education.
4. What is the importance of ecological education for humans?
5. Disclose the main directions of ecological education.
6. Disclose the importance of ecological education in the field of physical culture and sports.

#### 3. Assessment of ecological character building

1. Define ecological character building.
2. What should ecological character building shape?
3. What are the functions of ecological character building in the system of physical education of students?

#### 4. Assessment of ecological worldview

1. Define ecological consciousness?
2. What is the basis for ecological consciousness formation?
3. List the signs of ecological consciousness.

#### 5. Assessment of ecological culture

1. Define ecological culture.
2. Means of ecological culture formation.
3. Conditions for ecological culture formation.
4. Name the most important indicators of ecological culture formedness.

Thank you for participating in the survey!