Using the project methodology to improve environmental education for students of technical specialties

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Abstract. Environmental education of students of technical specialties should take into account the features of their future specialty. Within the framework of economic activity, humanity has a significant impact on the state of the environment. Natural resources, which took millions of years to form, are used in the production of various material goods. This production process leads to negative phenomena associated with the destruction of the fragile natural balance. In addition to the impact of biocenosis, economic activity also worsens the environmental situation and has a negative impact on the existence of human civilization itself. For effective public control and monitoring of the state of the natural environment, the necessary conditions are the availability of environmental education among the population and the training of technical specialists capable of solving various environmental problems. The project form of training allows to increase the efficiency of specialists of technical specialties. And the use of projects related to environmental problems in the learning process gives students the opportunity to supplement their environmental knowledge. The poor environmental situation is the main reason for the decrease in the level of immune status and the increase in morbidity in the population. The sustainable development of human society can be achieved only if a dynamic balance is established between the needs of man and the ability of nature to self-repair.

1. Introduction

Chaotic and predatory use of natural resources has caused many natural disasters. The rapid development of the world economy has led to the fact that this problem has become global.

According to [1], the majority of modern environmental problems are associated with the result of man-made impact on the environment.

According to [2], the consequences of the impact of modern man-made disasters are already comparable to the consequences of military operations.

The use of various toxic substances in human economic activity causes excess of permissible concentrations of harmful substances in water, in the air and in the soil.
According to [3], humanity is continuously increasing the degree of impact on the natural environment. The development of modern technologies primarily involves obtaining economic benefits and is often accompanied by ignoring most environmental problems.

When implementing commercial projects, as a rule, its effectiveness is determined by the achievement of certain specific goals or economic benefits.

According to [4], the use of closed production cycles and waste-free technologies can achieve solutions to many environmental problems.

Environmental problems in modern conditions are inextricably linked with the problems of morality, since morality and ecology are closely correlated. Therefore, the solution of many problems related to the environment is inextricably linked with the moral education of a person.

According to [5], at present it is necessary to pay great attention to the formation of environmental consciousness due to the fact that society pays insufficient attention to the problems of environmental education and education.

According to [6], environmental education should have a continuous character. It should be a single system that includes higher, secondary, preschool, specialized secondary education, as well as postgraduate education.

According to [7], environmental education should include environmental information in other traditional subjects and the formation of environmental knowledge in a specially designated academic discipline.

According to [8], continuous environmental education should be based on a new educational paradigm, according to which environmental education is not an integral part of the education system, but is its meaning and purpose.

According to [9], the worldview base of environmental education is based on two closely correlating approaches (Figure 1):

**Figure 1.** Approaches that determine the ideological basis of environmental education.

According to [10], the process of environmental education should, first of all, be based on the life experience acquired before, understanding the modern interpretation of the emergence of environmental problems.

Environmental education should provide for the learner's assimilation of ethical and legal norms of the relationship between nature and man.

According to [11], environmental education should be the most important component of the entire education system and contribute to the formation of a human worldview based on environmental and noospheric values.

According to [12], the competence approach has a great influence on the evolution of educational activities and its priority areas. Currently accepted educational standards in most cases characterize the competence of graduates as an indicator of the level of their professional training.

According to [13], the competence of an employee reflects his possession of professional competencies.

According to [14], in order to train specialists who are able to realize their competencies in solving various practical professional problems, it is necessary to pay more attention to solving practical problems during the training process.
According to [15], competence is a complex characteristic of an individual reflecting his ability to solve specific professional problems.

According to [16], the competence-based approach creates prerequisites for optimizing the educational process in order for students to acquire a holistic professional competence that would allow them to perform their professional duties qualitatively and independently improve their professional level in the future.

According to [17], the competence approach is a method that provides for modeling the results and goals of the educational process as criteria for its quality.

In our opinion, the competence approach is the principles of the organization of the educational process, which are based on the idea of training a specialist who can solve specific professional tasks.

In the modern educational process, the leading place is occupied by the need to teach students the ability to search and effectively use the information found to solve certain practical problems. Within the framework of the competence approach, the student becomes an equal participant in the educational process.

The project-based learning method is one of the widely used variants of the competence approach. To implement the project, its participants are required to possess basic life competencies. For the successful implementation of the project, its participants are required to determine the purpose of the project, draw up a plan and implement its practical implementation.

The implementation of the project motivates students to study the subject due to the need for creative activity during its implementation.

According to [18], the work on the implementation of the project requires its participants to use their knowledge, experience, strong-willed qualities, emotions and requires the ability of the project participants to work as part of a team.

According to [19], working on a project requires creative activity from its participants, but this creativity is not spontaneous, but is based on the experience, skills and knowledge available to the participants of this project before starting work on it.

The authors [20] identify the main components of the project method within the educational process (Figure 2):

![The main components of the project method in the framework of the educational process](image)

**Figure 2.** The main components of the project method in the framework of the educational process.
2. Methods
When performing this study, the authors used an analytical method, which made it possible to study the problems considered in the work in their unity and development.

Taking into account the goals and objectives of this scientific research, the authors used a functional-structural method of scientific cognition. In the end, this allowed us to study a number of problems related to the use of project methods to improve environmental education among students of technical specialties.

3. Results
During the Soviet Union, rocket science was highly developed in Ukraine. In the city of Dnepropetrovsk, rocket technology for military and peaceful purposes was produced. After Ukraine gained independence, production ties between many enterprises were cut off, mass privatization took place, and as a result, many enterprises changed owners. As a legacy from the Soviet Union, Ukraine received stocks of toxic rocket fuel, storage of radioactive materials, as well as various types of weapons that, due to the expiration date, required disposal.

In order to provide the labor collectives of machine-building enterprises with work in the conditions of a sharp drop in orders for the production of rocket and space technology, it was decided to use space technologies for peaceful purposes.

Within the framework of this research, a project was implemented with 4th-year students of the Faculty of Physics and Technology of the Dnipro National University on the topic "Space technologies for solving Earth problems".

Students were asked to propose a solution to the use of space technologies to solve environmental problems.

In the process of working on the project, students used specialized technical literature and searched for information from the Internet.

As part of the implementation of this project, students were invited to use the hulls of comic equipment to be disposed of for the production of containers for storing toxic substances. Stocks of such rocket technology hulls were available at machine-building enterprises, it was not profitable for enterprises to hand them over to metal. At the same time, these cases were made using space three-legs and were resistant to the external environment.

The solution proposed by the students interested machine-building enterprises and many of the project participants were invited to undergo practical training at these machine-building enterprises.

The students' ecological culture allowed them not only to take part in solving a technical problem, but also to make their feasible contribution to environmental protection.

The use of design methods in the educational process for students of the Faculty of Physics and Technology allowed them to take part in solving the practical problem of using rocket technology hulls, but also allowed them to increase the level of their environmental consciousness.

4. Discussion
Environmental education in modern higher educational institutions should take into account the specifics of training students in these educational institutions.

Environmental competence is one of the components of the general environmental competence of modern specialists. In the process of economic activity, a person has a significant impact on the state of the biosphere. The natural resources accumulated over millions of years are used for the production of various material goods. The process of producing these material goods is accompanied by a change and destruction of the fragile balance in the biosphere.

The very existence of human civilization also has a negative impact on the biocenoses of economic activity.
The existence of effective monitoring and public control over the state of the environment requires the implementation of environmental education among the population, as well as the training of technical specialists capable of effectively solving environmental problems.

The use of project-based learning technology in the educational process can greatly assist in the development of environmental thinking among students of technical specialties. It is the project form of training that allows students to develop research and cognitive skills, as well as independently acquire new knowledge, skills and abilities.

The implementation of projects related to environmental issues within the framework of project training allows the project participants:
1. To replenish the level of your environmental knowledge.
2. Learn to anticipate the consequences of the negative impact of human economic activity on the environment.
3. Improve your research and teamwork skills
4. To form a moral and ethical attitude to the biosphere.
5. Understand the place of man in the biosphere and his dependence of his habitat on environmental problems.

5. Conclusions
The environmental problems faced by modern man are one of the most important problems facing modern human civilization.

The reason for their occurrence is associated with predatory technologies of nature management in conditions of low stability of the biosphere.

The production of mineral fertilizers, the extraction of iron ore and other minerals lead to changes in natural landscapes and environmental pollution.

In turn, the poor environmental situation is the main reason for the decrease in the immune status and the increase in morbidity in the population.

Sustainable development of human society is achievable only if it is possible to establish a balance between human needs and the ability of ecosystems to recover from the negative impact of economic activity.

References
[1] Sevostyanov P 2021 Int Aff 67 24-34. 10.21557/IAF.67456389.
[2] Pontius J and McIntosh A 2020 10.1007/978-3-030-28542-5_8.
[3] Stover K 2018 10.1017/9781108550710.031.
[4] Alsabunchi A A and Alsabunchi O A 2020 Eur Un Scien 5 26-31. 10.31618/ESU.2413-9335.2020.5.76.929.
[5] Yekimov S, Khlebnikova T, Trukhan H, Kurilchenko V, Tkachov A, Ulianova V and Tomashevsksa A 2020 J. Phys.: Conf. Ser. 1691 012159 doi:10.1088/1742-6596/1691/1/012159
[6] Barbosa R, Lima R and Vicente J 2021 4 137-158. 10.36661/2595-4520.2021v4i4.11910.
[7] Pană A-D 2021 10.1201/9781003136712-4.
[8] Yekimov S, Getmanets G, Miroshnik L, Sosnina T, Havrylenko A, Vasylieva N, Zymivets N and Bondarenko Z 2020 J. Phys.: Conf. Ser. 1691 012221 doi:10.1088/1742-6596/1691/1/012221
[9] Khadka N 2017 Ban Jan 10 60 10.3126/banco.v10i2.17608.
[10] Toba D 2021 10.1007/978-981-16-2333-2_4.
[11] Kostenko A F 2014 Science Almanac 85-90. 10.17117/na.2014.061.
[12] Huzii N, Yekimov S, Kushniruk S, Yashanov S, Kholodenko O, Zvarych H and Vasylyshyn V 2021 J. Phys.: Conf. Ser. 1889 022011 doi:10.1088/1742-6596/1889/2/022011
[13] Orlova O, Makhina L and Spiridonova N 2021 The worl of acad: Cul, Ed 73-79 10.18522/2658-6983-2021-3-73-79
[14] Vasilevska D and Geske A 2020 340-34710.22616/REEP.2020.041
[15] Cheltybashev A and Aleksandrova E 2015 *V mire nauchnykh otkrytij* 3670 10.12731/wsd-2015-3.8-11.

[16] Dudnyk N 2017 *Ann Un Mar Cur-Sk, se J, Paed-Ps* 29 43 10.17951/j.2016.29.2.43.

[17] Dhar U and Dhar S 2018 49 45-50

[18] Isroilova D 2020 *Th and Ap Sc* 82 674-676. 10.15863/TAS.2020.02.82.119