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IMPROVING THE METHODOLOGY FOR THE DEVELOPMENT OF ENVIRONMENTAL COMPETENCIES OF STUDENTS IN THE INTERDISCIPLINARY TEACHING OF PHYSICS

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ABSTRACT

The article discusses the improvement of the methodology for the development of environmental competencies of students and pedagogical aspects to improve the technology for the development of environmental competence of students in the interdisciplinary teaching of physics. There are also new integrative model of physical education and the algorithm of its organization for the development of environmental competence among students.

KEYWORDS: *Ecological Competence, STEAM, Integrative Model, Ecology, Interdisciplinary Learning, Diagnostic Modules, Energy*

INTRODUCTION

In our country, the advantage of training based on a competency-based approach to education is provided, teaching students to use effectively in various situations encountered in personal, professional and social life.

The draft state educational standards provides for the formation of students' general competencies concerning the support and the subject. Core competencies - special attention is paid to the abilities, skills and activities that a person must possess for successful prosperity in society, regardless of what profession he has. From the core competencies, the "Competence of Nature Protection and Ecological Culture" was created in the following order:

- Explanation of ecological processes taking place in living and inanimate nature by means of physical laws;

- Preservation of the environment (water, air, land), their economical use;

- The influence of physical fields (noise, electromagnet, radiation) and the improvement of methods and means of protection against them;

- Rational use of natural resources, human influence on nature, study of global and regional environmental problems;

- explanation of the use of electric energy obtained by traditional methods, natural resources, their economical use and the study of ways to obtain alternative energy;

- Analysis of physical methods and means and life examples in the development of environmental monitoring of the environment.

In order to achieve an effective solution to the above problems, a systematic approach should be used in the environmental education of teachers, specialists in the field of education of the system of interdisciplinary teaching of the student's environmental competence.

When studying the global environmental education system in Germany, a direction is given to the formation of the behavior of environmental responsibility among the younger generation, in Austria, the environmental education program is included in the school curriculum, in the United States of America, the issue of deep implementation of the content of educational subjects in the content of environmental education in general education schools is considered, in the People's Republic of China, the history of environmental education covers a period of more than 30 years, there is proposed the inclusion of an ecology course in all educational institutions.

Practical work is being carried out in our country on the basis of a number of laws, regulations, orders on the issue of nature protection in the environmental education system. An ecological party has been established in Uzbekistan, and the Ecosan movement has been organized on a voluntary basis. Faculties of ecology are being created in higher educational institutions, a plan of the national movement for environmental protection of nature and stable development of the Republic of Uzbekistan has been drawn up. It pays special attention to improving the ecological situation on the territory of Uzbekistan; protection and improvement of the environment; rational use of land and water resources in order to preserve for the future generation; development of non-traditional energy sources and renewable energy sources.

"Improving the methodology for the development of environmental competencies of students in the interdisciplinary teaching of physics" it is about a rapidly and intensively developing society, science and technology, compliance with new production requirements, the ability to anticipate, bring to students not only the theoretical foundations of knowledge and skills, but also on the basis of acquired knowledge to develop their personal qualities, guide their individual qualities to set goals, study environmental problems arising in the future in personal, professional and social activities and develop the necessary environmental competencies for them to take measures to eliminate them.

The ecological and pedagogical model of the development of ecological competence of students in interdisciplinary teaching of physics is as follows (see Figure.1).

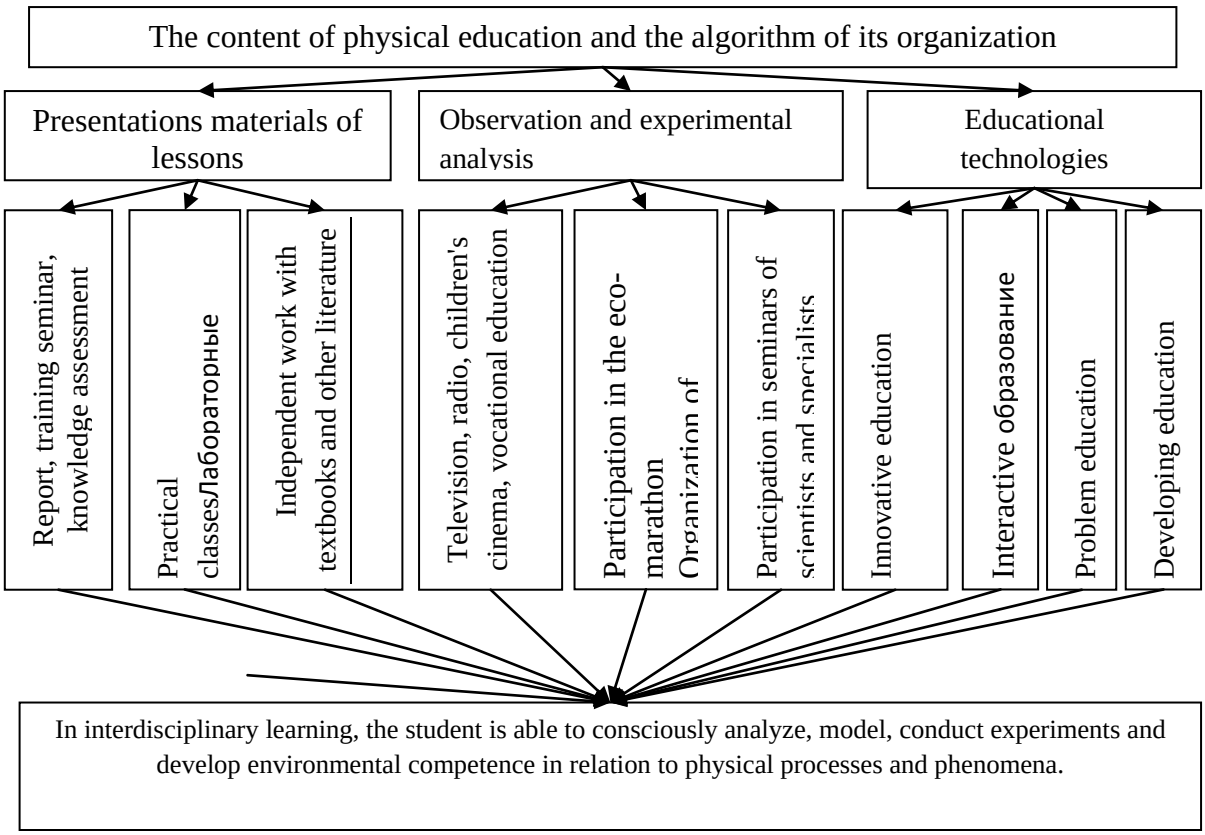

Fig. 1. Ecological and pedagogical model of the development of ecological competence of students in intersubject teaching of physics.

1. The first stage of the development of the student's ecological worldview is a lesson. In interdisciplinary teaching, a student can form knowledge of environmental competence through the following subjects: chemistry, biology, social studies, geography.

Students of grades VIII-IX have a very deep knowledge system in mathematics and physics. Especially the students of grades X-XI are in close active contact with the environment and society. Making reasonable use of these opportunities of students, a system of knowledge on their environmental competence has been created.

2. In observation and experimental analysis, the student uses the following sources: radio, television, Internet sites, international events and messages, events taking place in the country and the region, covered in newspapers and magazines; the logical structure of research works carried out in the field of ecotourism has been developed, changes in social life have been analyzed.

3. Pedagogical technologies - formed in the XVII century on the basis of the didactic tendencies of Ya.A. Komensky, are developing in the direction of the class-lesson system, which is currently most used in the countries of the world. The interdisciplinary teaching of physics uses "Developing educational technologies" and their types.

With the development of the student's environmental competence, when teaching physics with interdisciplinary communication, the requirement of training in direct connection with the

complex of the sphere of influence of physical fields on the environment, mechanisms, degree and methods and means of protection against them increases. Physical fields include the following: the development of technological progress, sound waves, noise generated during production, electromagnetic field, X-ray radiation, radioactive radiation, the flow of charged particles.

Examples of topics of the physics program in the development of environmental competence of students on the basis of integrability are given.

In lessons 61, 62, 63, 64, 65 about the "Sound phenomena" of Chapter VII of the physics textbook for the sixth grade. After a full explanation of the topics, the students are shown the negative effects of sound on living organisms. A sharp increase in the heart, cardiovascular system, gastrointestinal, hypertensive diseases of people is associated with noise, in the open air a person does not

In the IX class when explaining the topic to students “Evaporation and condensation”: 1. The device, application and actions of the “Solar Water Desalination Plant”, which turns salt water into fresh water, are described in detail. 2. Explains how evaporation occurs in plants, deterioration of the quality of consumption of vegetable products, carrots, potatoes and other vegetables, as a result of evaporation of moisture from their composition, it is indicated that in order to preserve useful properties, their constant storage at normal temperature is necessary. 3. When chemically solid and liquid substances evaporate, diffusion, spreading in the environment, pollutes the air. A person breathing such air can get poisoned, careful use of them is necessary.

In the physics program for the eighth grade on the topics "Power plants and their types", "Accidents of electrical networks", it is of great importance to explain to students traditional, non-traditional ways of generating electricity and new types of energy of the future.

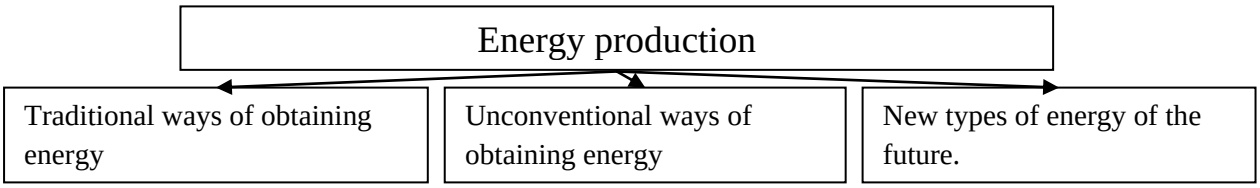

Fig. 2. Traditional, non-traditional ways of obtaining energy and new types of energy of the future

Currently, a nuclear power plant is being built in our country. Its total energy balance is the production of 2.4 GW of electricity. This will save more than 3*109 m3 of natural gas per year. The annual reduction of environmental pollution by harmful gases is explained to students, that is, up to 14* 106 tons of carbon dioxide (CO2), up to 36 * 103 tons of nitrogen dioxide (NO2).

When explaining non-traditional methods of generating electricity to students, the limitlessness of raw materials for energy reserves is explained, unlike traditional methods by their ecological purity and restoration. Among these methods, solar panels and wind generators have been well studied and widely practiced in recent years, and energy production with their help has been established.

For our country, one of the promising non–traditional methods is bioenergy. Currently, many projects of biogas production plants have been developed. This installation.

When studying these topics, the environmental aspects related to this topic are explained in detail.

The concepts of students on the economical use of fuel reserves used in traditional methods of energy production; on solving environmental and safety problems related to energy production; on the development of non-traditional methods of energy production are analyzed and improved.

XI class chapter IV. In lessons 33,34,35,36 in the section "Electromagnetic waves and optical waves", after a full explanation to those students, the negative consequences of the constant use of cell phones in our daily activities and the danger to life of the waves emanating from them are explained on scientific and life examples, the concept of their biological and hygienic effects are related to the knowledge gained on the subject of biology.

The analysis of what to sit for a long time near a color TV, a long conversation on a cell phone, long-term use of information and communication technologies has been carried out and improved.

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