

USING ALTERNATIVE ENERGY SOURCES DEVICES AS A TEACHING TOOLS

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ABSTRACT

The following article deals with a systematic analysis of the possibilities of using alternative energy sources as a teaching tool in the lectures of Physics, Chemistry, Biology, Ecology. The didactic possibilities of developing students' scientific competencies through the use of alternative energy sources in the education system have been studied. For continuous introduction of the achievements of modern science and technology in the teaching of Physics, Chemistry, Biology and Ecology in general secondary schools, vocational colleges, and for using alternative energy sources as a teaching tool some pedagogically based recommendations on options have been issued. Recommendations are given on the methods of explaining the content of topics through the integration of teaching materials in Physics, Chemistry, biology, Ecology, creating reusable teaching materials, organizing the access of students to educational materials at any time, the development of multimedia materials that make the content understandable. Opinions on the current tasks of using alternative energy source devices as a learning tool in explaining the content of training materials are presented.

Keywords: Integration, Physics, alternative energy source devices, learning material, teaching tools, creative ability, competence.

INTRODUCTION

The use of alternative energy sources as a teaching tool in the implementation of interdisciplinary integration in the education system implies the implementation of tasks such as professional orientation, educational continuity, interdisciplinary relevance, students' interest in the studied material, the implementation of polytechnic education.

The following article in some extent serves as implementation of the resolutions of the President of the Republic of Uzbekistan that was adopted on May 26, 2017 No PP-3012 "On the program of measures for further development of renewable energy, energy efficiency in the economy and social spheres in 2017-2021" [2], November 8, 2017 PP-3151- Resolution "On measures to ensure the rational use of energy resources"[3], and the Law of the Republic of Uzbekistan № LRU-539 of May 21, 2019 "On the Use of Renewable Energy Sources" [4].

The use of alternative energy sources as a teaching tool in the explanation of teaching materials in the natural sciences increases students' mastery, strengthens knowledge, develops logical thinking and creative skills, saves time in mastering the topic, serves to develop independent work skills and competencies.

Based on the ideas above, it shows that a number of tasks need to be performed to explain the use of alternative energy sources as a learning tool in the interpretation of training materials. In particular, it is necessary to acquaint students with the achievements of science and technology, to apply their knowledge in practice.

LITERATURE REVIEW

Integration of educational resources related to the use of alternative, environmentally friendly energy sources in the system of continuing education through heating and cooling of buildings from solar energy devices, fresh water, drying of fruits and melons, conversion of other types of energy into electricity, biogas and biomass and educational technologies is one of the urgent tasks.

The Action Strategy of the Republic of Uzbekistan for 2017-2021 provides for the promotion of research and innovation activities, the creation of effective mechanisms for the implementation of scientific and innovative practices, specialized research and experimental laboratories at higher education institutions and research institutes, high technology centers. and the establishment of technoparks"[1].

At present, in the educational process, it is important to ensure the integration of science, education and industry, using innovative educational technologies, taking into account the achievements of modern science and technology.

Based on the above priorities, it is important to familiarize students with information on alternative energy sources, to develop a scientific and methodological framework for the creation of a system of using alternative energy sources as a learning tool, to use natural energy sources in students. further development of competencies is required.

Yu.D.Sibikin and M.Yu.Sibikin's describe the followings in the textbook "Нетрадиционные и возобновляемые источники энергии": conventional and non-conventional energy sources, energy reserves, the dynamics of energy use around the world, non-conventional energy sources in meeting people's energy needs use, solar energy, wind, geothermal heat, solar water heaters, heat accumulators, solar power plants, wind energy utilization devices prospects for the use of wave power and geothermal heat power [5, p. 7]. These data do not provide a complete picture of the possibilities of using alternative energy source devices as a learning tool.

In the manual "Physical bases of use of solar energy" written by B.E.Khayriddinov, N.S.Kholmiraev, B.N.Sattorov given the following data: unconventional and renewable energy sources, physical bases of solar energy, thermal-physical processes in solar devices, solar in low-potential solar devices, information on the use of energy, the accumulation of solar energy, the conversion of solar energy into electricity, the calculation of theoretical and practical issues in solar devices. Also, the thermal physical processes that take place in solar devices, the results of experimental studies on the achievement of fuel energy savings and mathematical calculations are covered on the basis of physical laws [12, p. 4]. The information provided in this manual does not provide complete information on the implementation of interdisciplinary links.

METHODOLOGY

On the basis of the method of analysis, textbooks, manuals, scientific and methodological literature on the use of alternative energy sources as a teaching tool were systematically analyzed, best pedagogical practices were studied and ideas were collected.

On the basis of the observation method, the process of organization and teaching of Physics, Chemistry, Biology, Ecology and Geography in secondary schools and vocational colleges was observed.

On the basis of the method of comparison, the methodological basis of the use of electronic textbooks, multimedia software in Physics, Chemistry, Biology, Ecology, Geography and the didactic possibilities of teaching based on them were compared.

On the basis of the experimental method, the current normative documents on the organization of the educational process in secondary schools, vocational colleges and the experience of teachers with advanced experience working in educational institutions were studied, prepared on the basis of computer programs in Physics, Chemistry, Biology, Ecology, and Geography. Presentation materials, animations of processes on devices, educational films, multimedia electronic manuals, electronic copies of lectures, and practical trainings were organized and conducted.

STATEMENT OF THE PROBLEM

One of the most important issues is the organization of education on the basis of all didactic requirements. Textbooks and manuals, as well as materials and technical support play an important role in the full organization of educational process on the basis of students' normative. Textbooks, teaching and methodological manuals are an important factor in the development of scientific and technical and socio-spiritual, psychological and pedagogical, political and economic knowledge of students. There are textbooks, teaching and methodological manuals published in Physics, Chemistry, Biology, Ecology and other natural sciences [8, p. 87]. However, while these textbooks and manuals provide a basis for acquaintance with the fundamental foundations of science, they do not provide information of the achievements of modern science and technology.

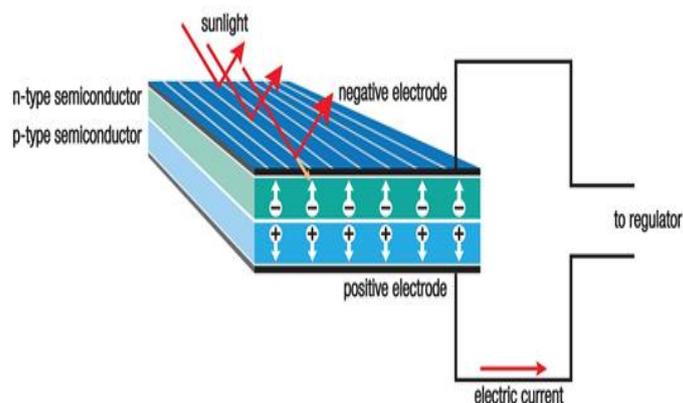
The possibility of using interdisciplinary integration in the education system is determined by the curriculum, the content and scope of the topic. Each science program includes topics learned from other disciplines. This list of issues helps the teacher to determine what knowledge can be relied on from other disciplines in passing this or that topic in the program [6, p. 43]. Integration of science and technology through the use of alternative energy sources as a teaching tool in explaining the content of teaching materials in a number of disciplines, such as physics, chemistry, biology, ecology, the laws of science, the application of phenomena in practice

RESULTS

Alternative energy devices can also be used as a teaching tool in the process of providing students with information on topics such as "Electricity in semiconductors", "Electrical conductivity of semiconductors and its temperature dependence", "Specific and mixed conductivity of semiconductors" [7, p. 19].

To do this, first of all, it is necessary to know the electrical conductivity, structure and bonding of atoms of semiconductors, their chemical properties. At the same time, it is necessary to recall the knowledge of students in Chemistry.

There are many ways to use solar energy, one of which is to generate electricity using semiconductor solar cells [11, p. 150].



1-The process of generating electricity in a silicon solar cell.

The process of converting solar energy into electricity is accomplished through a photoelectric effect. It occurs in the form of free electrons with a thickness of 2-3 micrometers in the semiconductor surface layers. When free electrons appear on the surface of a semiconductor and there is a difference in electric potentials, an electric current is generated in it. The potential difference occurs between the irradiated surface of the semiconductor and the shadow side due to the addition of special additives to its surface layers. One of the additions (*n*-type) generates additional electrons and a negative charge on the surface, while the other (*p*-type) produces a lack of electrons of a positive charge.

Mostly, silicon solar cells are used as silicon is the most common element on earth. The elements are obtained by melting silicon and then growing crystalline silicon in the form of a stem 5-10 cm in diameter. To obtain direct semiconductors, these rods are divided into thin plates about 300 micrometers thick. They are the main part of photoelectric elements.

The technology of making solar cells is as follows: by installing a silicon wafer in a high-temperature electric furnace, a semiconductor material of *p* or *n* type is introduced into the vacuum by diffusion [9, p. 177].

The main advantages of solar panels should have large coefficient efficiency, long-term operation, simplicity, large specific power (ratio of power to mass of the element), but relatively expensive and the need for additional power supply is one of the disadvantages of solar panels (Figure 2).



Figure 2. Solar cell made of silicon photo elements

One of the key aspects of the problem is to know spectral structure of solar radiation when using semiconductor photocells as solar [10, p. 85]. Therefore, it will be necessary to select a semiconductor material knowing the optical properties of the semiconductor and the electrical

properties that can effectively convert solar energy into electricity, indicating which parts of the solar spectrum can be used in the manufacture of a solar cell.

The use of such information in the classroom through the use of alternative energy sources as a teaching tool serves to ensure the mutual integration of disciplines.

CONCLUSIONS

The use of alternative energy sources as a teaching tool in the classroom helps to acquaint students with a deeper, more scientific knowledge of science, to prepare them to solve life problems.

Demonstration of various processes in the devices of alternative energy sources in the classroom with the help of computer programs serves to improve the methodology of formation of knowledge, skills and abilities of students.

As a result of interdisciplinary integration using devices from alternative energy sources, students can develop logical thinking and creative abilities, creative skills in the design and construction of various devices are formed.

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