THE STUDY OF THE METHODOLOGICAL SYSTEM AND ISSUES RELATED TO THE TEACHING OF PHYSICS AND ASTROPHYSICS IN HIGHER EDUCATIONAL INSTITUTIONS

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ABSTRACT: *Today, there are a number of problems related to the pedagogical point of view in teaching students, and in order to solve them, the article considers and studies possible methodological systems for use in teaching physics and astrophysics in universities.*

Keywords: *methodological system, physics, astrophysics, elementary particle, solar battery, uv range, fraunhofer lines, laboratory work.*

INTRODUCTION

The scope of the concept of "elementary particle" includes many elements of scientific knowledge about the nature, properties and mutual transformations of objects in the microworld. From a large number of elementary particles known today, an electron, a proton, a neutron, a photon, a positron, a neutrino, a 71-meson, a quark have been selected. The choice of particles is not random. The fact of their existence can be easily and clearly substantiated for students using examples from the history of the development of the physics of the microworld. These particles were opened gradually, one after another. The teacher has the opportunity to demonstrate to students the process of learning about nature. The student’s professional training should ensure his functioning as a teacher of physics and astronomy. Within the framework of the study, we are primarily interested in the training of students on issues of modern astrophysics.

As you study the course of physics, the following elements of scientific knowledge about elementary particles should be mastered:

- electron, proton, neutron, photon, positron, neutrino, 71-meson, quark, objects of the microworld studied by physics;

- properties of elementary particles: each currently known particle corresponds to an antiparticle, they differ in the sign of the electric charge.

Educational material about elementary particles in the course of physics for students is not allocated to a special section, acquaintance with the properties of particles of matter, the history of their discovery, methods of research and registration occurs gradually, in the process of studying the main course.

What problems need to be solved in order for the theoretical foundations of the methods of teaching physics to be more simplified:

- it is necessary to introduce the substantiation of the idea of the stage-by-stage formation of the concept of elementary particles in the study of the physical component of the physics course as the leading concept of the modern physical picture of the world;

- develop a meaningful model for the formation of the concept of elementary particles with two subsystems.

- to concretize a systematic approach to the formation of the concept of elementary particles through the construction of a methodological system that implements an earlier development of the personality of students and preparation for the systematic study of physics in universities.

The significance of the study lies in the development of:

- methods of step-by-step formation of the concept of elementary particles among students in universities, taking into account the task of organizing the productive and creative activities of students;

- the physical component of the integrated course of natural science of the system of tasks for students, a set of didactic, illustrative materials developed on the basis of information and communication technologies and a cycle of laboratory work using elements of scientific knowledge on elementary particles;

- topics of information, research, abstract and design work of students in the study of elementary particles;

- systems for diagnosing the levels of formation of knowledge, skills and competencies in the study of elementary particles.

The study of astrophysics can be formed if the content of the course includes important philosophical questions for students about the past and future of the Universe, about modern goals and objectives of the study of the surrounding outer space, about the latest achievements in the study of phenomena and objects of the Universe. The most important thing in this case is the explanation of the observed phenomena from the standpoint of fundamental and special physical theories, as well as the prediction on their basis of new unusual objects and phenomena of the mega-world.

One of the guiding documents for the development of the content and methods of professional training of specialists, curricula and student training programs is the qualification characteristic of a teacher of physics and astrophysics.

It should be emphasized that the rapid development of astrophysics was possible due to the use of physical research methods: all space technology was created on the basis of the achievements of modern physics. Therefore, the above requirement can be reflected in the study of numerous problems of modern astrophysics.

Having successfully completed his studies at a university, a teacher of physics and astronomy must have a scientific and humanistic worldview, To know the basic patterns of development of nature and society, to have a well-formed idea of the physical picture of the world, to know the forms and methods of scientific knowledge and their evolution, to own various ways of knowing and mastering the world around, to understand the role of science in the development of the world around . In this regard, the role of astrophysics can hardly be overestimated. It has always been and remains a worldview science, a deep knowledge of its provisions for a physics teacher is the basis of his ideas about the world in which we live.

For successful assimilation of the fundamentals of astrophysical theories, a fairly large set of teaching aids is needed. Some of them are used in training demonstrations and small labs based on published scientific results.

A modern astrophysical experiment, as a rule, requires complex and expensive equipment, the use of which in the conditions of a pedagogical university is very difficult, and in many cases even impossible. Experimental study of astrophysical phenomena in practical terms is possible only in an adapted form, either by computer simulation or by processing experimental data obtained in leading astrophysical centers. Laboratory works in this case are largely illustrative.

To do this, it is necessary to introduce six laboratory works, as well as those created on the basis of existing methodological recommendations, and nine computer demonstrations developed by students.

In the laboratory work "Experimental Observation of the Spectral Lines of the Sun" the goal was set for students to master one of the astrophysical research methods - spectral analysis. To do this, they had to study the device and principle of operation of the *UM - 2* monochromator, the rules for handling it, as well as with a rotary prism and the Spectrum device with a set of gas discharge tubes (H, He, Ne). The latter acts as a wavelength standard for calibrating the monochromatic and for identifying Fraunhofer lines.

Optical scheme of the installation for the observation of Fraunhofer lines. The Sun, which is the closest star to us, was chosen as the object of study. Thanks to the

original design of the entrance rotary prism, this laboratory work can be performed all year round during daylight hours, regardless of the location of the audience. Despite the fact that in this case we are studying not an exotic astronomical object, but the well-known Sun, students get acquainted with one of the main astrophysical methods - spectral analysis. We also note that this laboratory work is of interest to all physics students, and not only to those of them who are interested in astrophysics, and it is advisable to include it in the general physics workshop.

When performing laboratory work *"Solar battery - power source of space observatories"* students must master the knowledge of the device, principle of operation and characteristics of the solar battery as a source of electrical energy.

In the future, it is planned to supplement this work with the study of solar batteries of various types, as well as with the measurement of relative luminosity using a solar cell along the diameter of the image of the solar disk on the screen. The simplicity of this laboratory work allows us to recommend it also for extracurricular activities in universities.

In the process of performing the laboratory work "*Receiver of electromagnetic radiation in the UV-range*" students must study the device, principle of operation and characteristics of the receiver of ultraviolet radiation.

In the process of performing laboratory work, the possibility of detecting *UV* radiation by the receiver is investigated, and the attenuation of this radiation by filters made of different materials is also measured. The setup also makes it possible to simulate the absorption of ultraviolet radiation as it passes through the ozone layer of the earth's atmosphere. For this, organic glass filters are used, which imitate sections of the ozone layer of a certain thickness. After completing the work, students are asked to calculate the thickness of the ozone layer, the maximum attenuation of *UV* radiation in the atmosphere and other environmental parameters.

CONCLUSION

In conclusion, all of the above methodological properties in teaching physics and astrophysics, energy production are well suited for use in universities and problem solving in the framework of preparing students as professional personnel.

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