

# DIDACTIC PRINCIPLES FOR THE FORMATION OF STUDENTS' LEARNING AND RESEARCH SKILLS ON THE BASIS OF PHYSICAL EXPERIMENTS

<sup>1</sup>Tugalov Farkhod Karshiboevich, <sup>2</sup>Kadirova Iroda Sharofiddin kizi

<sup>1</sup>Associate professor (PhD), Department of Physics and Methodology of Teaching it, Jizzakh State Pedagogical University named after Abdulla Kadiri

<sup>2</sup>Master's student, Department of Physics and Methodology of Teaching it, Jizzakh State Pedagogical University named after Abdulla Kadiri

<https://doi.org/10.5281/zenodo.7876811>

**Abstract.** *This article describes didactic requirements aimed at performing laboratory work, mastering physical laws by students, developing educational and research skills, and increasing the effectiveness of physical experiments.*

**Keywords:** *physical experiment, source of knowledge, teaching method, instructiveness, physical phenomenon, process, law, skill, experiment, observation.*

Today, it is important to improve the quality of physics teaching in educational institutions, to introduce modern teaching methods into the educational process, to select talented students, to prepare competitive specialists for the labor market, to develop scientific research and innovations, and to focus on practical results [1].

The main goals and objectives of the program of comprehensive measures to improve the quality of education in physical sciences and ensure the effectiveness of scientific research in the field of physics in 2021-2023 [1]:

to introduce the integrative principles of teaching physical sciences in higher education institutions, to increase the level of coverage of young people with physics education by establishing the training of new and high-demand specialties in the educational market;

ensuring the integral connection of scientific research in the field of physics with production, expanding the scope of scientific work aimed at solving problems in economic sectors; work to increase the effectiveness and practical importance of scientific research and innovation work is defined.

It is known that in the educational process, physical experiments simultaneously perform the functions of a source of knowledge, a teaching method, and an instructive function. Educational experiments organized on a planned basis play an important role in the acquisition of new knowledge by students of physical phenomena, processes and laws.

In order to achieve the goal of conducting physical experiments, it is necessary to be able to attract the student's attention to it during the lesson, to be suitable for the subject of physical experiments, to be sufficiently interesting and interesting. Methodical skills and competence of the teacher are considered important in organizing and conducting physical experiments.

The initial stage of developing students' practical research skills in the study of physical processes is carried out with the help of demonstration experiments. It serves to perform the laboratory work indicated in the curriculum, to master the laws of physics by students, and to develop students' educational and research skills.

60110700-Physics and Astronomy for students of "Electricity and Magnetism" as a result of performing laboratory work, it is possible to form educational research skills in students [2]: including 1. "Magnetic core The purpose of the laboratory work "Measurement of the magnetic field induction of a non-inductive coil" is:

- measuring the magnetic field of an inductive coil without a magnetic core as a function of the current  $I$  passing through it;

- measure the magnetic field of an inductive coil without a magnetic core as a function of its length  $L$  and the number of windings  $N$ .

2. The purpose of the "Free Electromagnetic Vibrations" laboratory work:

- familiarization with the circuit of electrical vibrations;
- determination of the specific frequency of the vibration contour;
- analysis of current and voltage changes in the oscillation circuit.

3. The purpose of the laboratory work "Study of volt-ampere characteristics of a vacuum diode":

- measurement of the volt-ampere characteristic of the vacuum diode at three values of the cathode heating voltage;

- to determine the area of influence of the volumetric negative charge against the anode field and the saturation area of VAX;

4. "Measurement of the magnetization curve and hysteresis loop of a ferromagnet" laboratory work purpose: To study the magnetization of ferromagnets located in a changing magnetic field and the process of formation of the hysteresis loop.

5. The purpose of the laboratory work "Study of diode circuits":

- to study the functions of half-cycle and full-cycle rectifiers in converting alternating voltage into constant voltage;

- getting acquainted with diodes as an electrical component.

The didactic requirements aimed at increasing the effectiveness of the physical experiment should be as follows:

- when conducting physical experiments, it is necessary to observe the rules of technical safety in the physics room;

- in order to understand the phenomena and processes shown during the physical experiment, it is necessary for the student to have sufficient theoretical preparation on the subject;

- before conducting the physical experiment, the teacher himself tries to conduct the experiment and knows how much time is required for it, it increases the effectiveness of the training.

- it is important to achieve the set goal when conducting a physical experiment, otherwise, students' minds will have a lack of confidence in the physical experiment;

- it is advisable for the teacher to conduct the physical experiment based on the information given in the lecture, because the student cannot form a complete idea of the physical essence of the experiment by observing the experiment only;

- if the teacher familiarizes the students with the experiment instructions in advance during the organization of the experiment, the effectiveness of the physical experiment will be increased.

In compliance with the above-mentioned didactic requirements, the organization of physical experiments serves to clearly embody in the eyes of the student the validity and reliability of the studied phenomenon, process and laws. Fulfillment of these requirements will help students

to understand the importance of physical experiments and ways of using them in educational and research work, will enable them to form the skills of applying their knowledge in solving specific practical problems.

Physical experiment work is one of the types of independent work, in which students perform experimental work independently. As a result, they strengthen their acquired theoretical knowledge and increase their practical training. During the lectures, they will practically check the physical laws and phenomena in the experimental conditions, analyze the results obtained from the physical experiments, and get a clear idea about conducting educational and research work. Educational materials related to the organization of experiments and analysis of physical processes, selection of measurement methods, comprehensive coverage and explanation of objects and phenomena are selected from the subject of physics. It serves to develop students' skills in conducting educational and research work.

To ensure the effectiveness of physical experiments, the following are important: theoretical, practical and methodical training of the teacher; ability to prepare and organize training; the material and technical equipment of the experiment and the state of methodical support; as well as the level of training and activity of the learner.

By involving and preparing students for educational and research activities in educational institutions, it is possible to achieve their participation in educational and practical conferences, project works and exhibitions. By participating in events, they demonstrate their research capabilities, apply boldly advanced ideas, promising educational and practical developments and knowledge, and provide a guide to more difficult experimental work.

#### **REFERENCES**

1. Presidential Decree No. PD-5032 of March 19, 2021 on measures to improve the quality of education in the field of physics and develop scientific research.
2. 60110700- Curriculum of "Electricity and magnetism" for the field of physics and astronomy. Jizzakh 2022.