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Methodology for Carrying Out Laboratory Physics Classes

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Annotation: The article deals with the methodology for conducting laboratory work in physics. Several issues are considered, such as the scientific elements of the stages of laboratory classes, the influence of laboratory classes and experiments on the formation of scientific competencies of students the development of the worldview, and the role of laboratory work in studying the subject of physics. An example of the procedure for performing laboratory work and the structure of a laboratory work lesson are given.

Keywords: pedagogy, professional training, pedagogical methods, laboratory studies, training, teaching, physics methods, methods, efficiency, assessment, lesson, competence, devices.

Introduction

Teaching of physics in educational institutions in the decision of the President of the Republic of Uzbekistan dated March 19, 2021, No. Great attention is paid to improving the quality, introducing modern teaching methods into the educational process, selecting talented students, training competitive specialists for the labor market, developing scientific research and innovation, and focusing on practical effectiveness[1]. At the same time, several issues that have not been resolved in the field indicate the need to implement measures aimed at improving the quality of education and the effectiveness of scientific research in the field of physics.

Fundamentally improving the quality of education in physics, training highly qualified pedagogues and scientific staff, providing educational institutions with modern laboratories, textbooks, and other educational equipment, developing the potential of scientific organizations, and effectively organizing their activities, to establish close communication and cooperation between the fields of science and production and to ensure the timely implementation of the tasks specified in the Address of the President of the Republic of Uzbekistan to the Oliy Majlis of December 29, 202014 .06.23\PQ-5032 19.03.2021.pdf[1]. Focusing on the modern teaching methods of physics, the use of modern methods and methods in training, researched on current problems and their modern solutions.

LITERATURE ANALYSIS AND METHODOLOGY

The State program based on the principle of the strategy of actions to the strategy of development has been developed for the seven priority directions of the development of our country in 2022-2026. It focuses on improving the quality of education, bringing the knowledge and skills of pedagogues to the international level. There is a need for consistent and fundamental changes in the field of education. It is important to find the specific and appropriate aspects of teaching each subject, regardless of whether it is a practical lecture, seminar, or laboratory lesson.

In recent times, in the theory and practice of pedagogy, methods of classifying students according to the state of cognitive activity are being used. The methods used in the educational process should increase the student's activity and ensure deep mastery of the studied educational material. The system of methods proposed by I. Ya. Lerner and M. N. Skatkin fully meet these requirements. Their basis is both theoretical and practical cognitive activity of students. That is: Explanation is a demonstrative method. The teacher provides ready-made information to the students using various means, and they receive the information, understand it, and store it in their memory. The memorization method organizes the cognitive activity of students with a system of teacher tasks. And students acquire skills in images. As the volume of students' knowledge increases, the use of the first method together with the second will increase. A problematic statement. The teacher creates a problem situation. explains and solves the ways to solve it during the lesson. Partial search or heuristic method. The teacher tells the educational problem, divides it into auxiliary parts, and determines the way of research, and the students solve the problem by themselves. In this, the teacher tells the students some directions, for example, pre-formed questions. Research method. It is a method of organizing students' independent research and creative activity in solving a new problem, in which the teacher does not present a ready-made problem to them. The students themselves find it in the process of mastering the educational material, after which the teacher creates a problem situation. Traditional teaching methods - oral presentation, explanation, conversation, lecture, reading educational literature; carrying out experiments, showing natural objects and visual aids; exercise, written work, graphic work, laboratory work. By applying the above methods and methods, it can be considered that it will be effective not only in lectures but also in practice and laboratory classes.

In modern education, including higher education, the organization of laboratory training is one of the most important forms in the course of teaching concrete and natural sciences. Laboratory work is a necessary component of educational programs in all areas. The fact that laboratory works occupy an important place in pedagogical strategies shows the role of laboratory training in the improvement of the quality of education. Laboratory training is the main factor that connects theory and practice, ensures their unity, and is of great importance in forming and developing the skills of working with measuring instruments and conducting experiments, as well as strengthening the knowledge of students. In this article, we offer several methodological approaches for conducting laboratory work in physics at higher educational institutions of pedagogy. Proposed methodological approaches are laboratory work with elements of scientific research and a differentiated approach to

students according to their knowledge and skills. These approaches to laboratory training (in a general sense) can be used not only in the course of physics but also in the study of other subjects, including the humanities.

ANALYSIS AND RESULTS

The methodology of analytical work consists of deductive generalization of literature data and personal experience on the use of scientific elements in laboratory work and implementation of a differential approach to student learning.

1. Review of scientific literature. The course of physics and other general education subjects in higher educational institutions is aimed at solving the problems of developing students' skills necessary for the formation of highly qualified specialists [2]. Consistent and logical thinking, planning and organization of work, and working with devices and gadgets are all qualities that a mature specialist should have, and these skills are evaluated as the ability and necessity for future life and work. Pedagogical and psychological studies have shown that solving such problems is very difficult [2]. Although it is somewhat easier for students to acquire and develop professional skills (design and calculation of electrical circuits, measuring physical quantities using electrical measuring instruments, accurate weighing methods, etc.), in most cases, it is within a narrow scope. it remains: to develop the skills of practical implementation, it is necessary to achieve independent mastery of the textbook along with listening to lectures, in which case the rate of acceptance of factual information will increase significantly. [3]. But it is easy to forget this knowledge. If the results of the laboratory sessions are obtained and summarized, the level of mastery of the educational material will increase. In this sense, the importance of laboratory work is that it allows us to understand the essence of the studied physical phenomenon, to understand it more deeply, and to remember it. A student who has done the necessary research in the course of laboratory work will have the skills to conduct an experiment, work with tools, or apply a research method to the goals and tasks set by the teacher, but the student will learn from them in the form of life skills. can use The transfer of skills[5] requires more additional efforts from the teacher, for which the student today acquires specific knowledge and skills in the classroom that are necessary for him to perform certain tasks or for further studies at the university. should know that. In this case, the student's approach to special subjects and professional activities becomes more serious. In the process of mastering professional skills, he strives to master the professional skills and consciously improve his skills. One of the main tasks of the teacher is to provide sufficient information about where the acquired knowledge and aids are used to master the skills imparted to the student with positive results. For this, students should have a detailed idea of the content of the educational program, and the subjects to be studied. Only when the professional competencies of the educational field are acquired by the student, under the influence of a strong intellectual feeling, the skill can be transferred even to a completely different field from the subject being studied [7]. The main purpose of laboratory work is to understand the essence of the phenomenon or law under study, a process or relationship, the principle of operation of an instrument, or a method of measuring a physical quantity. In addition, elementary experimental skills are mastered in the classroom: organizing the

workplace, assembling devices, observing, performing measurements with tools, performing elementary calculations, analytically and graphically compiling the results of experiments, and drawing conclusions. Laboratory work is mainly carried out immediately after studying a certain phenomenon or law.

Stages of laboratory work. The following steps can be distinguished in the performed laboratory work:

Preliminary preparation.

Introductory interview.

Workflow specification.

Experimental part.

The final part.

Preparation for laboratory work. The success of the laboratory work depends on the teacher's accurate organization of the student's educational activities. At the beginning of the study of the subject, the teacher informs the approximate date of the laboratory work and its topic. In the lesson before the laboratory work, the purpose, the sequence of the work, and the safety rules are discussed with the students. During such a discussion, the basic theoretical knowledge, and general and special skills needed to perform laboratory work are updated. The main physical content of the work, as well as the list of main theoretical questions and tasks for it, are brought to the attention of students.

Preparation for the work before the lesson includes placing equipment on students' desks, handing out work instructions and notebooks for laboratory work, and putting several notes on the board (the number and topic of the laboratory work, if necessary, the order of equipment list, drawings). Equipment for laboratory work is kept in the laboratory room as a set of tools of the same type. Instructions for performing work in the laboratory and notebooks for laboratory work are also kept.

Introductory interview. The introductory interview begins with giving instructions to students on labor protection by the approved guidelines.

During the introductory interview, students' knowledge of the studied laboratory topic is repeated; the task of the work is defined; the properties of measured quantities, observations, and measurements are defined; measuring methods and features of instruments are explained; the order of measurement and observation (work progress) and the form of recording are determined. During the interview, the teacher puts the necessary notes on the board (if necessary, conducts

demonstration experiments). The theoretical part of the laboratory topic and the procedure of its implementation will be conducted with students who will answer questions of misunderstanding.

Experimental part. Students form groups of 2-4 people. Experimental devices are assembled by students. After the teacher checks the accuracy of the student's work, they carry out experiments, observations, and measurements. During the lesson, the teacher walks around the laboratory tables and observes the students' work. It is ensured that every member of the group is active. The activity is achieved by dividing the work: one student assembles one part of the installation, the other - the second; taking measurements is also distributed among students. If necessary, the teacher will help with advice or questions. Since not all students are equally proficient in laboratory work, some will be able to complete experiments and measurements relatively quickly. For such students, the teacher either suggests making repeated observations and measurements or gives an experimental problem to be solved using the equipment of this work.

Summary. The final part includes the calculation of the results of the experiment, the analysis and evaluation of the obtained values, and the calculation of the absolute and relative errors of measurements and calculations. After obtaining the necessary experimental data, students prepare a report. Students record the results of the laboratory work in a notebook for laboratory work, a graph is drawn (if necessary) and this graph is analyzed.

Students make a conclusion that corresponds to the purpose of the work and analyze the results of the laboratory work.

Fill in the columns of answers to control questions according to the topic of the work. Control questions are both theoretical and qualitative tasks. The answers given to them allow us to assess whether students have mastered the theoretical material on the subject.

The purpose of the final interview is to summarize the work done and analyze the work results. Homework consists of repeating theoretical material and solving problems on this topic.

Requirements for a written report. Students write written reports in notebooks for laboratory work. Before conducting laboratory work, the teacher reminds students of the basic requirements for designing a written report: sequence, form, and uniform spelling mode [4].

The written report is made in the following sequence:

End date.

Laboratory number.

Subject.

The goal.

Equipment.

Brief theoretical information.

Description of work progress.

Calculations, tables of measurements and calculation results, graphs (if necessary).

Summary.

Answers to control questions.

All entries are made directly in the notebooks after the experimental part is performed (or during the performance).

Assessment of laboratory work. Laboratory work must be done in class. Notebooks are collected after work. The quality of the work is evaluated. The price is mainly determined by the following factors:

The teacher monitors the activity of each student during the laboratory session.

The teacher evaluates the report.

The teacher talks with individual students both in the process of work and on the results of observation and measurement.

The teacher evaluates the student's knowledge of theoretical material by answering control questions [6].

While realizing the need for acquired knowledge and skills for future professional activity, students can be allowed to do laboratory work or other educational work as a hobby. When a student is inspired by a scientific idea or interested in the philosophical questions that arise in learning, he believes in the vastness and power of science, becomes confident in using the experimental method of research, and gets to the level of enjoying his work. Doing laboratory work builds the competencies to enjoy precise measurements. If the student learns accuracy and precision in all aspects of his work, if he makes accuracy his ideal, he will become a person who can approach problems scientifically.

CONCLUSION:

The result is research. The most valuable result of learning in the form of laboratory training is learning to understand the work of scientists, and for this, the student must do a certain part of the

scientific work with his own hands. To achieve this, laboratory work that includes elements of scientific research is best suited.

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