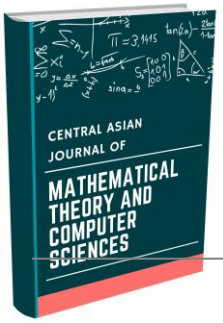

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USE OF MODERN EDUCATIONAL TECHNOLOGIES IN TEACHING PHYSICS (IN THE EXAMPLE OF ELECTROMAGNETISM)

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Abstract

This article discusses the use of modern educational technologies in teaching physics, and presents an example of the use of complex case technology in the educational process when studying the course "Electromagnetism". This technology is based on the solution of a professionally oriented problem underlying the formulated situational task.

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Our time is a time of change. New trends came with the new XXI century to the education of the Republic of Uzbekistan. New approaches to age-old problems have appeared how and what to teach, new pedagogical technologies, techniques, methods, new views on the relationship between the educator and the educated, the teacher and the student. Today, it is especially important to develop the cognitive activity of students, to form an interest in the process of cognition, in ways to search, assimilate, process and apply information, which would allow students to be the subject of learning easily navigate in today's rapidly changing world.

New technologies are being created, new teaching methods are being developed, and non-standard forms of conducting lessons, variable programs and textbooks, etc. appear. Success largely depends on the skill of the teacher. However, the desired result may not be achieved if the individual characteristics of the child are not taken into account.

Modern teaching at the university is faced with the problem of reducing the interest of students in the study of subjects. Society has long classified such a subject as physics as the most difficult. The teacher is faced with the task of arousing interest, not scaring off the children with the complexity of the subject, especially at the initial stage of studying the course of physics.

Being acquainted with a variety of modern pedagogical technologies in the areas of modernization, we chose the case-study technology. The methodology for the implementation of case technology attracted us with the practical possibilities of using it in the educational process. We decided to use this technology to implement a competency-based approach using the example of studying electromagnetism. The case technology developed by us is applicable when studying not individual issues of the physics course, but the section as a whole. The technology itself includes various parts of the case: practical, teaching and research. However, in the form in which it is described in the scientific literature, case technology (case method) can be used only

at the final stage of studying a topic. This use of practice-oriented technology narrows its possibilities. In this regard, we decided to complicate it, calling it complex case technology. The complexity of the technology is determined by the content (physics and special disciplines), by the structure and result.

The core of complex case technology is a description of the situation and a set of tasks for it. In the scientific literature, such didactic support of the method can be called a case. However, in this case, the meaning of the word contradicts the translation of the term "case" ("case" - case, event), applied directly to the description of the situation. In our work, we will also adhere to such a broad interpretation of the term, considering the case as a description of the situation and a set of tasks for it.

We started creating the case by analyzing the content of special disciplines, in the content of which one can see the possibility of using knowledge on the studied topics of the university course in physics. We have chosen the discipline "Measurement Theory", as in this course future bachelors develop knowledge about the theory of measurements, develop the ability to carry out measurements and calculations, evaluate the results of measurements, and acquire measurement skills that serve as the basis for any engineering specialties.

After analyzing the selected discipline, we identified one of the possible formulations of the course objectives: “To develop the ability to correctly conduct operations for checking the quality of product processing; find differences between measuring instruments, determine their purpose. When carrying out certain measurements, students need to make the right choice of the measuring device used. This is one of the significant problems of the "Theory of Measurements" course, since at present there are a sufficient number of types of measuring instruments that differ both in design and in the principle of operation. Based on the formulated problem, it is possible to create a situational problem, the solution of which can be implemented in the course of general physics when studying the section "Electromagnetism" (after the law of electromagnetic induction).

The text of the situational task. At the instrument-making enterprise, the machine operator (controller) needs to measure the wall thickness of the proposed sample, which has the shape of a cylinder (pipe), and evaluate its suitability for subsequent operation (presence of corrosion and others ...).

Until recently, at metallurgical enterprises producing pipes, up to 18-20% of workers were employed in control, while up to 10-12% of pipes from a batch were destroyed. At machine-building plants, the number of destroyed parts reached 15-20% of the batch, since after each main technological operation, samples were made from products for mechanical and metallographic tests.

An important criterion for the high quality of machine parts, mechanisms, devices are physical, geometric and functional indicators, as well as technological features of quality, for example: the absence of unacceptable defects; correspondence of physical and mechanical properties and structure of the base material and coating; compliance of geometric dimensions and surface finish with the required standards.

A non-destructive testing method should be used that does not require cutting out samples or destroying finished products, which makes it possible to avoid large losses of time and material costs. In addition, it is required to provide partial or complete automation of control operations while significantly improving the quality and reliability of products.

The solution of the set situational problem can take place in the course of general physics when studying the section "Electromagnetism" with students who have completed the course "Theory of Physical Measurements". By that time, students should be familiar with electrical and magnetic phenomena (electrification, magnetic field of conductors, electromagnetic induction, etc.) that are significant for solving a situational problem.

Based on the formulated situational task, we offer students to draw up a case map (if it is difficult for students to help them), which is a “guide” in obtaining the necessary information for students to understand a professionally oriented problem and formulate questions necessary to understand the significance of the

formulated situational task. For this, independent work with various literary sources on a given topic is supposed.

Further implementation of the complex case technology takes place in three stages and comes down to systematic work on the situation to solve a professionally oriented problem. The result of each stage is evaluated according to three indicators:

1) according to the formation of the corresponding motives of activity;
2) the formation of the components of professional competencies;
3) Contribution to the solution of the original situational problem.

We list the tasks of the main stage of the complex case technology:

1. Determine the level of students' knowledge of technical objects.
2. To give students basic knowledge in the field of physics.
3. To teach how to perform the main stages of solving multilevel physical problems in physics.
4. Systematize and generalize knowledge in physics.
5. Develop the ability to work in groups and speak to an audience.

The stages of implementation of the methodology should be summarized in the form of a diagram, which will present a process model of teaching physics at a university based on a complex case technology.

After including in the case tasks that form students' ability to think logically, perform mathematical operations and engage in research activities, we proceed to the formulation of the task-project. It is aimed at the development and research of technical objects, i.e., at scientific tasks, the solution of which will lead to understanding and solving the situational problem formulated at the beginning of the case.

As part of the studied section of the physics course "Electromagnetism", students can be offered project work on the topic "Scope of the electromagnetic method of quality control in industry."

The task of the project is wider than the formulated situational task; therefore, its implementation involves various types of activities:

1) abstract, as a result of which various fields of application of the non-destructive electromagnetic testing method can be described;
2) design and development, as a result of which a device is created for quality control of the product by the electromagnetic method;
3) experimental, aimed at quantifying the technical characteristics of the manufactured device;
4) Representative, during which a description of the project is made and preparations are made for its defense.

The levels of complexity of individual activities are different, which makes it possible to include all students in the project, differentiating tasks for them depending on their preparedness and capabilities.

Before embarking on project activities, it is necessary to analyze the purpose of the work and identify ways to achieve the goal. The result of the project activity is the solution of a situational problem based on the solution of a professionally oriented problem formulated at the beginning of the study of the course "Electromagnetism". One of the ways to solve the problem can be the creation of a technical device whose operation is based on one of the methods of physical measurements.

The project activity should be continued by being acquainted with the physical foundations of measurement methods, one of which is the eddy current method. To understand the eddy current method with students, the following topics can be considered:

1) familiarity with the concept of eddy current;
2) vector representation of the interaction of the field of the coil with the object of control;
3) area of applicability of the eddy current method;
4) position sensors (induction sensors);
5) Modern methods of registration of eddy currents, etc.

So, the research work done was completed by solving a situational problem and resolving a professionally oriented problem formulated in a case for students at the beginning of studying this section of the physics course.

Tasks-projects are the last step in creating a case. These tasks serve to organize students' vigorous activity, their independent work, including the analysis of educational and technical literature, obtaining mathematical models for solving a problem, and research activities. At this stage, professionally oriented problems are resolved and the situational task proposed at the beginning of the case is solved.

The implementation of a complex case technology using the example of the section "Electromagnetism" demonstrated the possibility of creating such a methodology for teaching physics, which is aimed at the gradual formation of professional competencies among future specialists throughout the study of a physics course at a university.

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