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Improvement of Teaching Technologies in the Department of Electrical Machines “Alternating Current Machines”

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Abstract: The article reveals that the lack of a comprehensive system of problem-based teaching of the department of Electrical Machines “Alternating Current Machines” in technical universities creates some difficulties in developing students' creative activity and creating problem situations on the topics. In the process of improving the technology of problem-based teaching of the department of Electrical Machines “Alternating Current Machines”, the development of theoretical knowledge, practical skills and competencies in students in relation to creating problem situations was studied.

Keywords: Electric machines, alternating current machines, problem-based learning technologies, independent thinking, educational materials, scientific hypotheses, creative abilities.

Introduction

Problem-based teaching of the Alternating Current Machines section of Electrical Machines Science differs in some specific aspects.

In the process of getting acquainted with the "Alternating Current Machines" section of the Electrical Machines Science department, students of technical universities in the 3rd year directly encounter the laws they have studied and the phenomena and processes they have observed in everyday life. This creates an opportunity to realize that there is an opportunity to link their theoretical knowledge with practice, to think independently. Students apply their theoretical knowledge in practice. This situation helps students, firstly, to creatively apply their theoretical knowledge of alternating current machines to practice; secondly, to make the educational materials understandable; thirdly, to consciously, thoroughly, and deeply master their theoretical knowledge; fourthly, to form practical skills and qualifications.

Methods

Students now live in an era of scientific and technological development. Each student is directly involved in the design of new equipment and its operating principles [1]. This, in turn, requires students to thoroughly and deeply study the basics of alternating current machines. From observing students and conducting questions and answers with them, it becomes clear that they have difficulty applying their theoretical knowledge of alternating current machines in everyday

life. Students do not have the practical skills and qualifications to independently observe the theoretical knowledge of alternating current machines, analyze them, draw scientific conclusions and generalize them, conduct experiments, and perform laboratory work. Almost no attention is paid to the development of students' creative abilities. Students cannot creatively apply their theoretical knowledge in practice during the study of alternating current machines. At the same time, most students do not fully understand the role and importance of alternating current machines in learning the secrets of using equipment. This, in turn, reduces students' interest in studying AC machines. Problem-based teaching of AC machines in the third year of technical universities, firstly, helps to develop students' creative abilities; secondly, to develop their logical thinking and observation; thirdly, and most importantly, to form practical skills and qualifications [2].

Results and discussion

Determining the level of theoretical knowledge of students shows that problem-based learning of alternating current machines is of great importance in developing students' logical thinking [3]. However, it is rarely used in electrical machines lessons. This is directly confirmed by the students' answers to the following questions:

1. Why are the magnetic cores of electric machines made of ferromagnetic materials?
2. What moments does the electromagnetic moment of an electric machine balance? Why are additional poles installed?
3. List the types of magnetic fields. How is the electromagnetic coupling coefficient between coils determined?
4. What steel is the main pole magnetic core made of? How is the magnetic circuit calculated?
5. What do the air gap and the field in it depend on? What affects the magnitude of the magnetic field in the air gap?
6. What percentage of the main field is the magnetic field in the air gap?

The students' answers to the above questions showed that they did not have theoretical knowledge, practical skills and qualifications related to alternating current machines [4]. The above conclusion was also confirmed by the results of the questionnaire questions given to the students.

Below we give an example of the questionnaire questions for teachers [5]:

1. Do you use the problem-based teaching method in electrical machines lessons?
2. Have you studied any scientific problems with students in lessons and extracurricular activities?
3. Are there enough textbooks and teaching and methodological manuals for students' independent work?
4. Are students interested in solving any problems in electrical machines lessons?
5. Are you familiar with the problem-based teaching method of electrical machines?
6. What do you think is the importance of problem-based teaching of alternating current machines?
7. Do you think that problem-based teaching of alternating current machines has an impact on the development of students' creative abilities and logical thinking?
8. Do you try to teach students to work and think independently in electrical machines lessons?
9. What innovative methods and techniques of problem-based teaching do you use in electrical machines lessons?

The conducted written questionnaires revealed that teachers practically do not use innovative methods of problem-based teaching in electrical machinery lessons. In many higher education institutions, teachers teach electrical machinery only in an informational form, without paying attention to students' independent thinking and creative work.

The results of the written control work showed that the theoretical knowledge, practical skills and qualifications of the students in alternating current machines are shallow. The student cannot apply the theoretical knowledge he has gained in alternating current machines in practice. He does not know how to independently create, solve, and analyze a problem situation related to alternating current machines. As can be seen from the above data, the use of problem-based teaching in teaching electrical machines in many higher educational institutions in our country does not meet the requirements of the time. At the same time, there are not enough methodological manuals and educational literature for studying materials on alternating current machines using the problem method in higher educational institutions. This further complicates the situation.

Currently, the section “Alternating Current Machines” of Electrical Machines Science using the problem-based method does not pay enough attention to the independent thinking of students. The section “Alternating Current Machines” is one of the main sections in the teaching of Electrical Machines Science in higher education institutions. Problem-based teaching is important for students to thoroughly and deeply master alternating current machines [5].

In the lessons of electrical machines, the independent thinking of students can be organized through the following interactive (case study, brainstorming, teaching, syncwine) integration methods: creating problem situations and solving them positively, asking problem questions, organizing independent work of students, using role-playing elements, making special mistakes in the lesson process, and their independent solution of these mistakes.

“Problem” means a difficult question, issue and task that requires a solution. “Problem” as one of the logical principles of didactics is considered by philosophers to be “knowledge of ignorance” or a variety of questions, the solution of which is not in previously acquired knowledge, therefore, it requires a certain creative activity to acquire new knowledge.

In our opinion, one of the most important stages of teaching electrical machines is the creation of problem situations. Only after the problem situation has been created can a hypothesis be put forward. That is, the first stage of creative thinking is to understand this problem. Based on this, solving problem situations can be divided into the following four stages:

- Identifying, understanding, and formulating a problem; formulating scientific hypotheses and selecting a scientific hypothesis;
- proving a scientific hypothesis;
- analyzing the results obtained and methods for solving them.

The essence of these stages is as follows:

1. Identifying the problem and creating problem situations is one of the main and important ways to solve a problem. In many cases, identifying the problem is more difficult than solving it.
2. The stage of formulating and selecting scientific hypotheses to solve the problem. If the problem is well mastered by the student, then it is possible to proceed to the stage of formulating a scientific hypothesis to solve the problem.
3. Scientific proof. This stage occupies the main time in solving the problem. During this time, the relationships, connections and connections between phenomena and processes are comprehensively revealed.
4. Analysis of the results obtained. Method of creating problem situations. One of the most

important issues in problem-based teaching is the creation of problem situations. Many teachers find it difficult to create problem situations in lessons.

The creation of problem situations, in addition to meeting the basic principles of didactics, should correspond to: the nature of the educational material; - the technical capabilities of the task; the students' perception of the problem situation, their level of preparation; the type and form of the lesson in which the problem situation is created.

Below are four rules for managing the process of mastering students in a problem situation:

1. The explanation of the studied educational material should be consistent with the emerging problem situation and respond to the emerging need for knowledge.
2. The studied information can be conveyed by various methods, taking into account the students' levels of preparation and their different creative abilities.
3. Students should use the information they have received or the type of activity they have mastered to complete the problem task set at the beginning of the lesson.
4. If the task is difficult for the student, it can be given in the form of several consecutive problem tasks.

These rules can serve as didactic recommendations for the teacher in the process of organizing problem-based learning in certain circumstances.

In his methodological manual, the researcher shows with specific examples the options for organizing the creation of problem situations using frontal demonstration experiments. He shows the ways of using new materials in problem-based teaching and consolidating the material studied. He also shows the ways of students in performing demonstration experiments and performing problem experiments.

An analysis of educational and methodological literature shows that problem-based teaching in didactics improves the content of education, facilitates the assimilation of materials from the curriculum, demonstrates the main ideas from them, and ensures the formation of knowledge.

Students' success in acquiring knowledge depends not only on the structure of the learning material, but also on the psychological regularity of their assimilation of the learning material.

Problem-based teaching of the section "Alternating Current Machines" of the science of electrical machines is one of the main ways to form scientific knowledge in students.

It is appropriate to cite the following conditions that ensure the formation of their theoretical knowledge through problem-based teaching of alternating current machines:

1. Creating the necessary conditions for each new concept to take into account the life experience of students, their daily observations, and previously acquired knowledge.
2. Creating problem situations, which allow them to draw conclusions about the inadequacy of the concepts they know to explain the new phenomenon or facts they analyze. Selecting facts that ensure the formation of new knowledge in the minds of students.
3. When choosing specific aspects of problem-based teaching of alternating current machines, taking into account the level of development of students' thinking and theoretical knowledge, as well as practical skills and qualifications.
4. Increasing the activity of student activity in the process of problem-based teaching .

The analysis shows that there are different views on the problem-based teaching of alternating current machines. It is not enough to rely on the students' concrete perception of abstract concepts. Here it is advisable to start by posing problems and analyzing classical experiments. If the section of electrical machines “Alternating current machines” is not taught problem-based, the theoretical knowledge acquired by students turns into knowledge that is not related to

anything. The student can only remember and, if necessary, apply it to solve problems. In this case, the basic rules do not play their inherent role, do not provide a unified knowledge.

Problem-based teaching of the section "Alternating Current Machines" of electrical machines is carried out as follows:

1. Ensuring a deep, thorough, comprehensive understanding of the connections and relationships of the studied phenomena or objects.
2. Studying from abstraction to concreteness in a deeper way.
3. In the process of studying educational materials, it is aimed at forming appropriate concepts, ideas, skills and competencies in students, and on this basis, developing independence of understanding and thinking, and creative abilities.

In conclusion. If a student can transform previously acquired knowledge into theory and use it to solve scientific problems, he will have reconstructed his knowledge twice. In order for students to solve scientific problems, they must thoroughly know the previous materials and take them into account in the theoretical knowledge, practical skills and qualifications they acquire later.

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