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## **DEMONSTRATION EXPERIMENT AND ACTIVATION OF LECTURES ON THE DISCIPLINE FUNDAMENTALS OF ELECTRICAL ENGINEERING AND ELECTRONICS**

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**Abstract:** This article discusses the main tasks of using a demonstration experiment and the activation of lectures on the discipline fundamentals of electrical engineering and electronics.

**Keywords:** lecture, demonstration, teaching method, research, electrical engineering, experience, experiment.

### **Introduction:**

Special importance is attached to improving the quality of teaching the basics of electrical engineering and electronics in connection with the introduction of modern military educational institutions operating on the basis of electrification and automation of military equipment. The development of science, changes in its content, methods and means inevitably cause the emergence of new ideas and tasks in the educational process in higher military educational institutions.

When conducting lectures, the skillful use of a demonstration experiment is important. Having stated a difficult question, the lecturer switches the audience's attention to the demonstration. Thus, he translates them from auditory to visual perceptions, focuses attention, arouses interest in the issue under study and concretizes the theoretical position. Lecture demonstrations in electrical engineering were given due importance from the very beginning of the formation of this discipline. His first famous experiments on the study of the properties of electric current back in 1802. the first Russian electrical engineer, academician V.V. Petrov, began to demonstrate at lectures. The experiment was given great importance not only as a research method, but also as one of the effective tools for demonstrating them in the educational process. In 1802-1807, a number of scientists, including professors of Moscow University P.I. Strakhov, F.F. Reis, experimentally investigated the electrical conductivity of water and earth and widely used their experiments for educational purposes. Until the end of the last century, when there was still an accumulation of information about the physical processes of electrical phenomena, when there were no formed theories of these phenomena, teaching was conducted largely on the basis of the experimental method. In connection with the development of theory, the ratio of experimental and theoretical teaching methods is changing in favor of the latter. In the future, the experiment is given little time at lectures, but it plays an important role as one of the methods that provide confirmation of theoretical positions and the effectiveness of assimilation of the material.

### **Methods:**

Didactic requirements for the demonstration were developed, the first attempts were made to determine the role and place of the lecture experiment. The use of the experiment in lectures on electrical engineering does not lose its relevance to this day. According to the cadets, in order to increase the effectiveness of the lecture, it is necessary to strengthen the experimental basis. The results of the survey conducted in higher military educational institutions helped to identify: the cadets assign the most important place to conducting an experiment with subsequent generalization and conclusions. This was supported by the majority of those who took part in the survey.

In the educational process, the experiment acts as a means of scientific and at the same time accessible to cadets' disclosure of phenomena and patterns in the discipline under study. The use of demonstration experiments at lectures on electrical engineering should be given considerable attention in higher military educational institutions. Demonstration of experiments, operating models of electrical devices not only increases the effectiveness of the lecture, but is important in the methodological training of cadets in their future activities.

### **Results:**

The study of the state of the problem of the demonstration electrical experiment showed that its systematic study was not carried out and, in general, the state of the issue cannot be considered satisfactory. The demonstration electrical experiment is still being built without sufficient consideration of the characteristics and functional relationships of the main groups of electrical engineering objects, the composition, structure and content of the basic concepts of electrical knowledge, which reduces the scientific level of acquired knowledge. As the analysis of the literature shows, the teacher's demonstration of various experiments in electrical engineering classes during the training of future officers is of great importance for improving the efficiency of the educational process. This is noted in their works by V.M. Grammati, O.A. Ionina, N.A. Pyatnitsky, B.M. Shevaldin and others. Questions revealing the meaning, place and role of the demonstration experiment in the study of electrical engineering are reflected in the works of O.N. Bratkova, Y.M. Borisov, D.N. Lipatov, I.A. Lomov, A.E. Kaplyansky, G.D. Polyanina, M. Kurbanov, Sh. Sodikova, D. Yunusova and others. With the help of demonstration experiments, the electrical engineering teacher achieves a deep understanding of the issue being studied by the cadets, mastering the theoretical foundations of the phenomena being studied. Demonstration of experiments helps to solve a diverse range of tasks in the educational process:

1. Contributes to the disclosure of the physical nature of phenomena and patterns underlying the work of modern machines, apparatuses and devices;
2. Shows qualitative differences between the phenomena of technology and establishes quantitative relationships between their main parameters;
3. Provides a visual representation of the various sides of the device, the principle of operation, operating modes, etc.;
4. Promotes the development of technical thinking of trainees.

In the process of cognitive activity of trainees, a demonstration experiment can act both as a support for sensory perception and as a means of developing abstract

thinking: during the experiments, trainees not only observe and listen, they also compare, compare, analyze, make generalizations and conclusions, etc. Demonstration experiments introduce trainees to modern scientific methods of research of electrical processes and tests technical objects.

We believe that a lecture experiment can take place in any part of the lecture, depending on the content of the material being read and the methodological expediency of its inclusion. When selecting the role and method of a lecture experiment, it is necessary to be guided by a specific educational and methodological situation. Only those lecture demonstrations that meet certain didactic requirements have methodological value. Such requirements for demonstration experiments in engineering and electrical engineering are set out in the works of A.A. Bytev, G.D. Polyanina, M. Kurbanov, and others, can be reduced to the following:

1. Organic combination of demonstrated experiments with the studied material;
2. Scientific credibility;
3. Good visibility of the demonstrated phenomena;
4. Persuasiveness;
5. Preparedness or reliability

One of the reasons for the unsuccessful staging of the experiment is insufficient preliminary preparation and lack of verification. There is nothing more harmful than experiments if they usually fail. An effectively executed demonstration always evokes a positive emotion of the cadets, it is well fixed in memory.

#### **Discussion:**

The formation of the basic concepts of the topic should take place on the basis of a physical demonstration experiment and be supported by the practical work of students. The methodology of demonstration in the study of complex objects by the method of the so-called "scheme development" is proposed by N.G. Ioffe. Its essence lies in the fact that "... the object is not studied in its final form, but in the process of creation, with the gradual addition of new details and along the way clarification of their role." The well-known principle of operation of an asynchronous motor is as follows. When an alternating current passes through the windings of a (usually 3-phase) stator, a rotating magnetic field is excited; this field crosses the conductors of the rotor winding and induces an alternating EMF in them (based on the law of electromagnetic induction); since the rotor winding is closed, the EMF causes a current in it that interacts with the rotating magnetic field, resulting in electromagnetic force acting on the conductors of the rotor; the force creates a moment under which the rotor rotates in the same direction as the magnetic field with a slightly lower speed than the field. In our opinion, it is advisable to give such a description of the principle of operation before demonstrating the current asynchronous motor model. And during the demonstration, you can very briefly comment on the principle of operation, linking the explanation with individual parts (nodes) of the device and their functions. Methodological literature is recommended to use experiments to reveal the concept of the principle of operation of technical objects. In our example, the electric motor must be, on the one hand, connected to the source of electricity, and on the other, to the working machine by the consumer, then



it will perform certain work and thus manifest its function. This technical function is easy to reveal with the help of a demonstration experiment in parallel with the disclosure of the principle of operation.

### **Conclusions and Suggestions:**

The content of lecture demonstrations is determined by the content of the subject being studied. The analysis carried out, for example, in the works of M. Kurbanov and other authors, showed that in the content of a general technical subject, it is usually possible to distinguish: 1) questions of technology (theoretical foundations and description of the device, operation of means and objects of labor); 2) questions of technology (theoretical foundations and description of technological processes); 3) information about the types, methods of production, physical, chemical, mechanical, technological and other properties of raw materials and materials.

In the course of electrical engineering, it is also possible to highlight material reflecting these classification groups of equipment and the corresponding concepts, which mainly represent the issues of the device of electrical objects, the principle of their operation, i.e. the actual equipment (circuits, devices, machines), especially in such topics as "Transformers", "Electric machines", "Electric meters" materials, i.e. substances, for example, some properties of conductors, dielectrics and magnetic materials. There are some issues of technology, where methods of processing by means of thermal and chemical action of current are considered. For technological specialties, it is advisable to expand this classification group.

Thus, electrical knowledge includes, although not to the same extent, concepts related to all major groups of technical knowledge: engineering, technology, materials. When studying the educational material of these groups at lectures on electrical engineering, there should be a demonstration of relevant experiments.

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