GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)
ISSN (E): 2347-6915
Vol. 11, Issue 03, March. (2023)

DIDACTIC ANALYSIS OF EXPERIMENTAL SKILLS DEVELOPMENT CONDITIONS OF STUDENTS IN INSTITUTIONS OF PEDAGOGICAL HIGHER EDUCATION

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ABSTRACT

This article analyzes the conditions, tasks, educational methodical support and didactic requirements of teaching the science of electrical engineering in higher educational institutions of pedagogy. Pedagogical tasks of using application-oriented educational technologies as the main educational principles in the teaching of electrical engineering are analyzed.

Keywords: Electrical engineering, teaching conditions, tasks, educational technologies, problem situation, didactic requirements, demonstration experiments.

INTRODUCTION

Electrical engineering is a fundamental science, the basis of which is the study of electrical and magnetic phenomena and their practical application. The application of electrical engineering mainly covers the field of technical sciences, in which electrical devices and their working principle, the processes of production, transmission and distribution of electricity are studied. One of the most important tasks is the rapid development of the field of electrical engineering, the training of qualified personnel with electrical engineering and electronics education in order to ensure the constant need for specialists in almost all branches of modern production.

Uzbek scientists A.I.Khonboboev, N.A.Khalilov, A.S.Karimov, M.I.Ibadullayev, M.M.Mirhaydarov, H.K.Aripov, G.O.Ernazarova, SH.A.Pazilova, K.O.Urinov, T.A. Makhmudov have expanded the didactic support of electrical engineering [1-7].

S.A. Borminsky, V.V. Afonin, I.N. Akulinin, A.A. Tkachenko, M.V. Nemsov, A.S. Kasatkin, L.V. Ravichev, V.Y. Loginov, Y.A. Belyayeva, Y.A. Komissarov, N.A. Makenova, T.YE. Khokhlova, L.L. Shiryayeva in the countries of the Commonwealth of Independent States [7-13] Educational literature on electrical engineering was created by scientists such as.

D.D. Dondokov, A.Y. Kaplyansky, O.V. Filimonova, A.I. Shimarov, V. Sapenko method of teaching the basics of electrical engineering and electronics was developed by Methodist scientists such as [7-13].

According to the analysis of scientific and educational literature related to this subject, the problem of the emergence of the process of teaching the basics of electrical engineering and electronics lies in the intersection of research areas of pedagogy, psychology and technical sciences.

The development of electrical engineering, which is a practical user of electric and magnetic phenomena, is closely related to social, economic and environmental problems of scientific and technical progress. Therefore, electrical engineering training plays an important role in the formation of the professional outlook of graduates of technical universities.

The task of the science of fundamentals of electrical engineering and electronics is to prepare competent specialists with knowledge, skills and abilities that can be applied practically in the

fields (engineering, science, industry). The science of electrical engineering is considered important in the training of personnel in pedagogical higher educational institutions. By teaching the basics of this science, future physics and technology educators will prepare the ground for perfect study of the structure and operation of electric machines, automatic start-up of electronic devices, laws and processes of electric circuits.

Each taught subject, in this case electrical engineering, has its own characteristics and requires appropriate teaching methods and organizational forms. Didactics, on the other hand, examines the general rules and laws inherent in the teaching of all subjects, to learn about which it is necessary to rely on the teaching of each individual subject. Thus, the essence of teaching in higher education shows its uniqueness, which requires consideration not only in terms of goals and tasks, but also based on the principles of teaching.

The methodology of teaching the fundamentals of electrical engineering and electronics is inextricably linked with physics, mathematics and general technical sciences. Also, the scientific, demonstrative, understandable presentation of the information given by the teacher during the training, the effective use of educational resources, technical tools and information communication technologies by the teacher in the course of training, and the teaching skills of the teacher create the basis for achieving high success in teaching.

METHODS

In the course of our research, some conflicts affecting the teaching of electrical engineering and electronics fundamentals and the training of competent specialists in this direction were studied in pedagogical higher educational institutions. These are: firstly, the traditional method of teaching electrical engineering in educational institutions does not work well in modern conditions, which place high demands on the content of the future specialist's professional activity, secondly, in the fact that the software with clearly expressed trends of using the possibilities of information and communication technologies in the teaching of electrical engineering has not been developed, thirdly, the rapid penetration of modern electrical and electronic devices related to electrical engineering into our daily needs, and the fact that information about these devices is not reflected in our current educational literature, fourthly, in the curriculum of electrical engineering and electronics electrical conductors in pedagogical higher education institutions, the volume of lecture hours is not enough (see table 1.1).

For example, in the curriculum presented in Table 1.1, Chirchik State Pedagogical University 60110700-Physics and Astronomy Teaching Methodology has a total of 46 hours of classroom hours, 20 hours of lectures and 30 hours of practical training. In addition to the auditorium, 72 hours are allocated for independent education. 60112300-Technological education courses have a total of 60 classroom hours, 30 hours of lectures and 30 hours of practical training. In addition to the lecture hall, 90 hours are allocated for independent study.

Table 1.1

At the Chirchik State Pedagogical University, the fields of study are Electrical engineering and "Electrical engineering, electronics and electrical conductors"						
S/n	Code of education and name	Total audience hour	Lecture Training	Practical Training	Laboratory training	Independent education
1	60110700– Fizika va astronomiya	118	20	26	–	72
2	60112300– Texnologik ta'lim	150	30	30	–	90

Currently, various teaching methods are used in educational activities organized by the teacher. These are: explanatory, descriptive, reproductive, problem-based learning, heuristic conversation and research methods. Russian pedagogue I. Lerner divides these general didactic methods into two groups according to the content and nature of teaching. Reproductive, in which the learner redevelops knowledge and methods of activity known to him; productive, in which the learner acquires new knowledge independently or partially with the help of a teacher. In our opinion, in training sessions organized on the basis of reproductive methods, the teacher can give a large amount of information to the listeners during a pair of sessions, but the possibility of assimilation of this information by the listener or its long-term memory is limited. When training in this way, the teacher is usually active, but the listener is passive. The productive (effective) method of teaching is widely introduced into educational practice today. In this method of teaching, the student takes an active part in solving problem situations, including designing and conducting experiments with a creative approach.

In the educational process, educational information is presented to the audience in various ways, i.e. through lectures, practical and laboratory exercises, and independent study.

The lecture is a part of the teaching process. The main didactic goal of the lecture is to develop the foundations for future mastery of the educational material by the listeners. The methodology of conducting lectures is to implement the principles of problem-based teaching, to convey the theoretical information given in the content of the lecture and its actual place in practice, to reflect the achievements of scientific and technical development, to create an opportunity for the listener to form thinking about technical experiments, to train the memory, focuses on the development of logical and intellectual thinking.

Independent education, like a lecture, is the highest form of educational activity, and the question of its organization at different levels of education (general education, secondary-special, bachelor's, master's, and post-higher education) is in educational institutions. is widely discussed in recent times. Psychological-pedagogical relations between a teacher and a student are considered important in the effective organization of independent education. It is known from pedagogical practice that if a person has a well-formed independent cognitive activity, the effectiveness of the educational process will be high. Also, the implementation of an individual

approach to the organization of independent education, taking into account the student's receptiveness, makes it possible to develop cognitive and creative qualities in the object - the student. Also, the implementation of an individual approach to the organization of independent education, taking into account the student's receptiveness, makes it possible to develop cognitive and creative qualities in the object - the student.

In the model science (syllabus) program approved by the Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan for the Chirchik State Pedagogical University, 30 hours of lectures on the science of electrical engineering, electronics and electrical conductors are allocated (single-phase sinusoidal alternating current circuits, three-phase current, transformers, electrical measuring instruments and electrical meters, semiconductor rectifiers, asynchronous electric motors, alternating current machines, power generation, power transmission and distribution, electricity It is intended to provide information on the basics, the main elements of radio electronic circuits, semiconductor devices, amplifiers, electronic calculators, harmonic oscillators, the principle of signal conversion, radio transmitting and receiving devices, the basics of television).

Alternating current generation and equations; Active resistance in alternating current circuit; Inductive resistance in alternating current circuit; Capacitance resistance in alternating current circuit; Current and voltage resonance; Power factor and its importance; Three-phase system; Star and delta connection methods of a three-phase system; Power of the three-phase system; Single-phase transformers; Three-phase transformers, use of ulul; Electromagnetic system devices; Electrodynamic system devices; Devices with magnetic electric system; Ferrodynamic system devices; Induction system devices; Current, voltage and power measurement methods; DC machines; Three-phase asynchronous motors; Descriptions of DC machines; Descriptions of alternating current machines; Generation and transmission of electrical energy; Methods of distribution of electrical energy; Basic elements of radio electronic circuits; Discrete electronic devices; Amplifiers; Generators with harmonic oscillation; Radio transmitters; Radio receivers; Block diagram of black-and-white televisions; Basics of color television; Reading the signs of resistors produced in the industry; Errors in the value of resistors produced in the industry; Equations when the resistor is connected in parallel and in series; Expressions of capacitors in the scheme; Read expressions written on industrial capacitors; Errors in the value of capacitors released in the industry; Structure and types of inductance coil; Electron and its charge; Brand of transistors; Formation of field transistors; Field transistor input and output characteristics; Conventional signs of the field transistor; Thyristor structure and characteristics; Expressing the process of signal amplification in amplifiers by means of a graph; Gain coefficient of a multi-stage amplifier; Characteristics of the transformer amplifier; Ensuring vibration stability in the generator; A total of 90 hours of independent study on topics such as the circuit and operation of a multivibrator is intended for students to acquire knowledge, skills and abilities related to engineering.

It is recommended for students to draw up a project of experiments with the help of electrical engineering programs, to conduct experiments with the help of a teacher, to prepare abstracts based on the results and to present them.

In traditional teaching, the following didactic tasks are mainly focused on conducting practical training on the fundamentals of electrical engineering and electronics in auditoriums. These are:

clarification of the important features of the concept, element, device given in the lecture;

connecting the relationship between the studied concept (some dimension) and previously learned concepts;

use of learned concepts in solving educational problems.

Training of teachers of technical and natural sciences occupies an important place in the personnel training system. We can show the role and tasks of the experiment in the educational process in the scheme described in Figure 1.1 below:

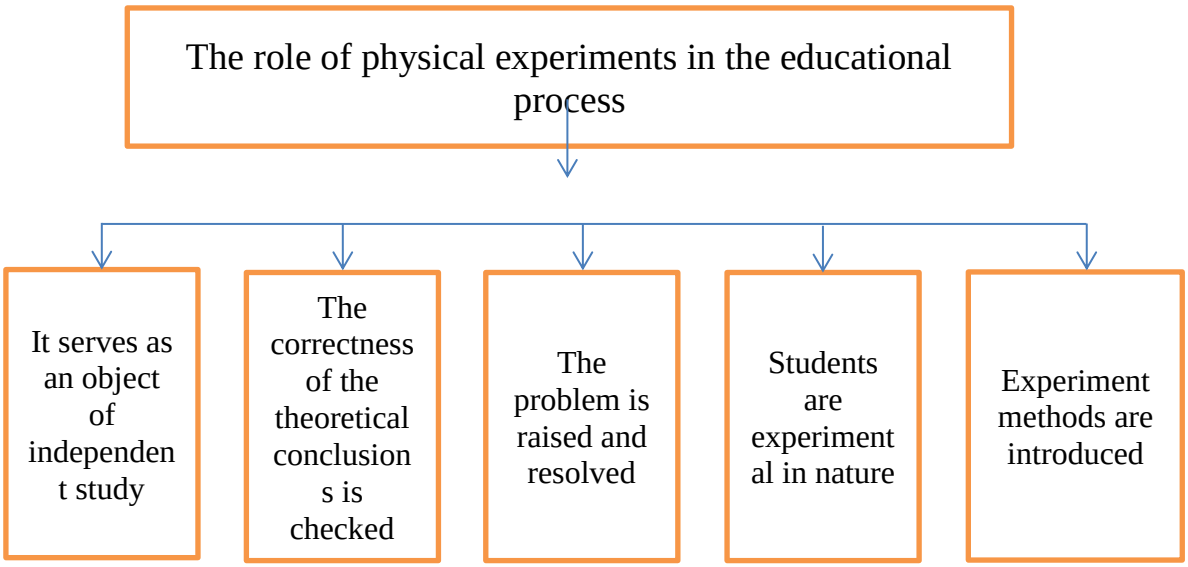

Figure 1.1. The role of physical experiment in the educational process.

It is also possible to observe that students use manuals intended for technical higher education institutions during practical training (laboratory) in electrical engineering in pedagogical higher education institutions. It is clear to everyone that the ways of preparing bachelor teachers for general secondary schools, academic lyceums and vocational schools and training bachelors of production engineers are methodologically different. Pedagogy should be a special direction of higher education institutions. A modern teacher is required not only to have deep, versatile knowledge, but also to have high experimental skills. We will try to base this opinion on the activity of the future teacher in general secondary education and secondary-special, vocational education, related to performing experimental work and conducting demonstration experiments.

Demonstration experiment is the presentation of a phenomenon during the course of the lesson in conditions where it is convenient to study with the help of special tools. It increases students' interest in the studied material and ensures deep mastery of the subject. In addition, it serves to implement polytechnic (engineering) education at the school, as well as allows students to be introduced to the principles of development of modern technical devices and tools.

Demonstration of experiments shows the materiality of the world and the objectivity of natural laws in the student's mind. Experiments in the science of electrical engineering are also considered as a means of aesthetic education of students. A well-prepared experiment (for

example, experiments to demonstrate the operation of transformers or a DC motor) will leave a strong impression on the student, and will remain in the memory for a long time. The experiment can be done by the student himself, but it is often preferred to be demonstrated by the teacher. This can be explained by a number of reasons:

1) acceptance is not a simple reflection of authenticity, so students cannot always clearly see what is needed for the experiment, the teacher directs the students' attention to the experiment during the experiment;

2) many demonstration experiments are rough and require practical experience and thorough preparation from the student;

3) conducting demonstration experiments by the teacher allows less time to be spent during the lesson;

4) some experiments, for example, working with mercury, a number of experiments related to electricity are considered dangerous for students.

A demonstration experiment, often performed by the teacher in front of students, is aimed at developing students' imaginations about phenomena, processes, laws, concepts, the structure and principle of operation of equipment. Demonstration experiment methodology involves solving issues such as the implementation of the experiment to the extent that it gives the best result, technical preparation, maximum impact on students by spending less time. In particular, it solves the following questions: in which sequence the experiment is performed, how important areas of the experiment are divided, what should be paid attention to so that students can reach the intended conclusions, how fast some parts of the experiment are performed, how many times the experiment is performed, etc.

At the heart of the demonstration experiment technique are tools and actions that ensure the effective implementation of the experiment. The experimental device should be easily visible from any location in the classroom. The effectiveness of the experiment can be achieved if the students comply with the following requirements: meaningfulness, reliability, demonstrability, visibility, reasonableness, brevity, beauty (tastefulness), emotionality, compliance with technical safety. Reliability of experiments means that every experiment demonstrated by the teacher gives the intended positive result.

CONCLUSION

Demonstrations must be carried out in parallel with a good explanation, because sensory perception alone cannot guarantee the formation of a correct image. In the process of observation, students may not be able to focus on the important features of an object or event. As a result, an incomplete, imprecise and even incorrect picture of an electrotechnical phenomenon or process can be formed. Reception is not limited to the activity of the senses. It is possible to understand the real world correctly only when intuition and thinking are in harmony.

According to the analysis of scientific and educational literature, it can be concluded that innovative changes in education, including the innovative strategy of the educational process in pedagogic higher education institutions, the design of the content of education, the use of multi-variant educational technologies, and the development of professional engineering education requires the development of a scientific basis for enriching methodological support.

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