

Development of Students' Independent Learning Activities In Teaching Theoretical Electrical Engineering

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Abstract:

The article explores teaching methods that encourage self-study and their effectiveness, as well as an analysis of traditional and independent learning approaches. Development of methodology and teaching recommendations for teaching theoretical electrotechnical science, which will promote the development of independent learning activities of undergraduate students in higher education. The results of the research are the process of teaching undergraduate students of the higher education system, the development of methods for applying independent thinking in practical work on theoretical electrical engineering. The content, structure and structure of the Theoretical Electrotechnical Science in Higher Education Institutions The theory of teaching electrotechnology is about determining the effectiveness of teaching when using non-traditional teaching methods and lectures aimed at forming independent thinking.

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I. INTRODUCTION

It is more important now to focus on spirituality and enlightenment, on moral education, on the youth's aspirations for knowledge and maturity, as the world is changing rapidly, and with the emergence of new threats and challenges threatening the stability and sustainable development of nations.

In order to implement the tasks set out in paragraph 4.4 of the Action Strategy for Development of Uzbekistan in Five Priorities for 2017-2020, the following are the current tasks:

Further policy of continuous education, increasing the availability of quality educational services, continuation of the policy of training highly qualified specialists in line with modern labor market requirements;

Equipping educational institutions with modern teaching and laboratory equipment, computer equipment and teaching aids;

- improving the quality and effectiveness of higher education institutions through the introduction of

international standards for assessing the quality of education and training, and gradually increasing the admission quotas for higher education institutions;

Encouraging research and innovation, creating effective mechanisms for implementing scientific and innovation achievements, establishing specialized research laboratories, high-tech centers and technology parks at universities and research institutes;

Continuous improvement of all normative documents in the education system based on the experience of advanced foreign educational institutions and the intensive development of science[2].

On April 20, 2017 the Republic of Uzbekistan signed a decree on radical improvement of the system of higher education, radical revision of the essence of personnel training in accordance with the priorities of socio-economic development of the country, creation of necessary conditions for training highly qualified specialists in accordance with

international standards. Presidential Decree No. PP-2909 "On Measures for Further Development of Higher Education."

According to this decision, each higher educational institution will establish close cooperation with leading foreign scientific and educational institutions abroad, the wide introduction of modern educational technologies, educational programs and teaching materials based on international educational standards in higher education. One of the most important tasks for the further comprehensive development of the system.

It should be noted that higher education institutions in order to strengthen their scientific potential, carry out practical and innovative research and development activities on the orders of enterprises.

The National Program for Personnel Training "Modernization of education and training system, adaptation to advanced democratic legal state building, system and content of personnel training based on the social and economic development perspectives of the society, modern achievements in science, culture, technology and technology. Reconstruction" is one of the main objectives of the program.

Since the adoption of the National Program in recent years, there have been major changes and transformations, the legal framework for education reform has been raised to become a priority policy of our state, continuous education has been fully implemented, and a substantial plan to improve the material and technical and intellectual base of educational institutions. The modern information and communication technologies are rapidly developing into the system of education, new educational literature and new educational technologies in general. and the environment for mutually beneficial cooperation with reputable foreign educational institutions is being formed.

Reforms in the education system of our country since independence require clarification and innovation of the goals, objectives and ways of implementing the quality of living processes.

The Law of the Republic of Uzbekistan "On Education" addresses the problem of developing the methodology, content, objectives, form and methods of higher education that can meet the requirements of the time[4, 12].

It is well-known that training of highly qualified specialists meeting the modern requirements is one of the urgent issues facing higher education institutions. The solution of the difficult tasks of education and upbringing of young people depends on the ideological beliefs, professionalism, talent and culture of teachers, the use of modern pedagogical and information technologies, and the involvement of students.

In the context of accelerating the socio-economic development of our society, the emergence of a factor for the development of the ability of young professionals to work independently is becoming a requirement of the time. Nowadays, it is necessary for young people to think creatively and to act independently.[1]

One of the main tasks of the university is to develop independent educational activities of future specialists, to ensure the co-operation of academic and research activities, to involve students in research, and thus to improve the quality of training. These problems, their solution, the preparation of the teacher, his pedagogical scientific skills and the successful performance of students in their future professional activities have become important.[4, 8]

Wherever you are in the world, you will always find that there is always a need for independent research and study in a particular area. In particular, the importance of independent learning in the field of technical sciences is increasing day by day.

In the developed world, independent learning is widely promoted, and this method of learning leads to a continuous improvement in business processes and professional skills.

In Asia, especially in economically developed countries such as Singapore and Malaysia, many newspaper articles on this topic are published and a number of television programs are aired. They argue that the importance of independent learning is

significant and is one of the key factors for economic development and contributes to the country's competitiveness in the global market. Specific guidelines for improving one's ability to learn, such as the Malaysian Eighth Plan, are given. The Plan states that in order to achieve the objectives of the "Mission 2020," the system of secondary specialized vocational education (CSTO) should focus on training multi-level workers, which will allow them to "work on a regular basis, gain in-depth knowledge of their field and should open up to the latest technology. Therefore, independent learning is widely promoted and supported in order to improve the knowledge of students.

The problem of developing students' independent learning activities in teaching theoretical electrical engineering (Electrotechnical) is of great pedagogical and methodical significance. The development of independent learning activities of future professionals will require a combination of future pedagogical and academic work. At the same time, the teacher should have a new vision and be able to provide methodological and technical support to their activities.

II. LITERATURE REVIEW

In recent years, higher education institutions have entered the education and training system as a challenge for modern student self-organization. It is worth noting that the problem of independent work has long attracted the attention of a number of scholars. Problems of professional training, development of students as a person, their professional orientation are the following in the scientific electronic journal "Economics and Innovative Technologies". № 1, January-February 2018 1/2018 (No. 00033) www.iqtisodiyot.uz is reflected in the research of 3 scientists. In particular, A.R. Khodjabaev[18] developed a methodological framework for the creation of a training and methodological framework for training of teachers of labor education, justifying the role and importance of the complex in teacher training. Nishonaliev[19] has studied the entire system of

training teachers of labor education for historical periods. R.H. Djuraev[20] and Ya. Haydarov[21], Problems of improving the training of specialists in a market economy, P.Z. Ishanov[22], A.Q. Ishmatov[23], M.I. Mahmutov[24] and A.A. Shoyusupova[25] has problems with the provision of educational and methodological complexes of the specialist training process, as well as U.I. Inoyatov[26], P.T. Magzumov[27] and N.A. The Muslim scholars[28] have done research to improve occupational and vocational education. In the course of teaching electrotechnical disciplines, insufficient research work has been done to develop students' independent research skills and abilities.

III. RESEARCH METHODOLOGY

Problems as a methodology of research and literature review; methods of pedagogical observation, conversations, pedagogical-experimental works, expert evaluation.

IV. ANALYSIS AND RESULTS

In today's rapidly developing scientific and technological progress, the challenge of developing students' creative abilities to develop independent thinking is of great economic importance, which can be seen in the educational experience of developed countries.

In the context of accelerating the socio-economic development of our society, the emergence of a factor for the development of the ability of young professionals to work independently is becoming a requirement of the time. Nowadays, it is necessary for young people to think creatively and to act independently.

After the Republic gained independence, special attention was paid to the quality of training. The use of information and communication technologies in the training of personnel is important in modern conditions. For this reason, the specialty should be able to use advanced pedagogical technology, not only master the subjects.

Higher educational institutions are equipped with modern educational equipment and computers. In the

higher educational institutions, new pedagogical technologies and modern teaching aids, computer facilities are used in teaching electrotechnical science, which gives its results.

More than half of the teacher's work in the electrotechnical process is spent on a blackboard showing students how to solve the problem. This means that the teacher does not have enough time to deliver the material to the students at the specified time. During the course of the lesson, the student will not be able to understand the plot of the board even if it is too late. When a student asks a teacher what he or she does not understand, the teacher will have to delete the drawing and explain it again to the student. This results in excessive teacher time. Practical lessons are best explained in problem solving. The student understands the problem in the course of the lesson and, as a result, when going home, some students find it difficult to determine the sequence of the problem, and there are times when they fail to complete the tasks. During student homework assignments, they seek solutions through the use of recommended literature, and some cannot complete the task without determining how to solve the problem. As a result, students have an understanding that electrical engineering is difficult. This idea of students creates many difficulties in teaching them. New pedagogical technologies and many traditional teaching methods are used to change students' perceptions of electrical engineering, and the teacher strives to make the lesson more interesting.

Students face great difficulties, especially when doing independent work. These problems are mainly due to the lack of inadequate and inadequate e-textbooks and manuals. These problems can be solved positively if they are created with excellent electronic textbooks and electronic manuals.

New teaching technologies help to improve the quality of education. Any new pedagogical technology should be used depending on the nature of the subject being taught. Some professors are developing science curricula using new pedagogical technologies, using the new pedagogical technology,

but its use is ineffective. Therefore, such pedagogical technologies have a negative impact on the course. In the course of electrotechnical lessons use thematic slides, lesson presentations and various visual materials. The use of such teaching tools facilitates the lesson and saves teacher time. The division of the problem into several stages in textbooks for universities has its effect on the size and cost of the textbook. Therefore, it is not appropriate to prepare textbooks in this way. As a result of equipping universities with computers, the use of computer technologies in the learning process is introduced. In some cases, computers can only be used in place of visual displays. Problems in teaching are the lack of electronic lecture rooms in universities to use computer technologies and the inadequate qualification of the teacher of electrical engineering to use computer technology. Therefore, there are not enough electronic textbooks, manuals, texts of electronic lectures on Electrical Engineering. Electronic libraries of higher educational institutions have electronic versions of texts of lectures on electrotechnical disciplines. Some faculty members create electronic textbooks by incorporating these lectures into Microsoft Front Page. This textbook is no different than a normal book. To use these e-books independently, students need to develop the skills to work independently. This means that in order to develop this skill and enhance their creative abilities, students should be given independent creative tasks that are appropriate to their level of knowledge.

The content of science or subject matter comes first in the development of creative abilities of students. The structure of the teaching material and the manner in which it is presented are also of great importance. If we just want to introduce students to new information, it is enough to make ready theoretical conclusions. If not only to inform them but also to develop students' creative abilities in the learning process, they need to explain what factors underlie the learning processes and how they have validated the theory.

Independent learning is a characteristic of activating a student's creative activity, in which the acquired knowledge is deepened, and at the same time his mental abilities develop and expand.

Independent work should not be a retraining, that is to say, a key activity in every student. The student independently carries out the scientific and creative work which he started, and then continues the learning process with this skill. Students work in the classroom in the classroom, all students try to absorb the information at the same time, and the teacher oversees it.

Independent work of a student is a work carried out under the guidance and supervision of a teacher without his / her participation in which new knowledge is formed and personal confidence to apply the knowledge gained in practice. It is one of the most important forms of the learning process, which is based on advanced pedagogical technologies during lectures, seminars and workshops and extends beyond the time of study.

The main purpose of the students' independent work is to develop and develop the knowledge and skills required for independent work under the guidance and supervision of a teacher, academic, methodological, scientific, and scientific and pedagogical activities.

When the student is engaged independently outside the classroom (Information Resource Centers), the process of learning the information is different and the performance of the independent work differs from that of the classroom, that is, the student plans his or her own activities. Self-assessment, monitoring and self-evaluation in the ways that he or she likes, the student will be able to repeatedly practice independent work (TMI), interpret the theory and use dictionaries.

In the consistent implementation of the National Program for Personnel Training, it is important to organize independent student work. Because the curriculum and curriculum of all technical faculties of higher education are 44-48% of the total workload of students, such as 5310200-Electric Power Engineering Education Curriculum and Classroom. that is 44.4% of total load. This means that the student must study the material independently for 44.4% of the material which he / she must master. Theoretical Electrotechnology, which is part of the general professional disciplines of this area, is allocated 190 hours for independent education - 46.8% of the total load (406 hours). An analysis of the curriculum of the 5310200-Electric Power Engineering is presented in Table 1.

Table 1

№	Name of academic disciplines and blocks	Total upload	Classroom studies	Independent education	
				Hours	%
1.	Humanities and Natural Sciences	2058	1256	802	38,9
2.	General professional subjects	2226	1234	1002	45
2.1	<i>Theoretical Electrical Engineering</i>	406	216	190	46,8
3.	Specialty subjects	2178	1104	1074	49,3
4.	Additional subjects	450	256	194	43,1
	Total	6912	3840	3072	44,44

Expected results can be expected only if students have a need for independent work. For this purpose,

when assessing a student's knowledge of the subject, it is important to take into account the extent to

which the student has performed their own independent work.

Independent work assignments should not only mean coursework, coursework, and calculus work, as these tasks are carried out in accordance with specific areas and laws. As students perform these tasks independently, they also gain the ability to work independently. This will be the first step to a student's creative work. In addition to developing this skill, they also need to access various publications and internet information.

Students also have the ability to work independently as they perform their own independent work. This will be the first step to a student's creative work. In addition to developing this skill, they also need to access various publications and internet information. In addition to the basic literature, reading additional literature, analyzing, observing, researching these or other scientific ideas in practice will all contribute to a deeper understanding and assimilation of knowledge gained in the course, to develop thinking, to form positive aspects of the mind, and finally to develop the scientific outlook. Therefore, self-employment training would not be effective without it.

If knowledge is independently understood, felt, and learned through difficulties, then that knowledge is fully and deeply absorbed. All of this is accomplished in libraries and home-based work, and depends on the learning curve, skills in teaching activities, time management, self-control, bug fixes, and so on.

Constantly engaging in mental activities by the student develops the need for mental activity and teaches students how to save time.

Nowadays, when it comes to the learning process, experts have started to use the term "independent learning" more often. Indeed, in the context of a sharp increase in information flow, rapid improvement in modern technology, declining jobs, and inadequate rhythm in other areas of society, it will be useful for the individual to search and learn.

Independent learning can take many forms. For example, it may be in the form of memorizing

certain information (rules, formulas, dictionaries, etc.) or as a way to solve theoretical and practical issues of varying complexity. Anyone who is interested in learning, of course, is always active and manages his actions. Contrary to self-study, it always means following someone's help guidelines. These second category delegates live in the hope of knowledge of others. They are limited to specific information, instructions, tasks and tasks that a teacher can provide. Such students do not ask too many questions. They observe, listen to and follow the behavior of their teachers.

Independent learning is a natural form of learning. Our children are always active and active, and thus they are gradually beginning to conquer the world of knowledge with their games. They learn a lot because of the results they achieve as a result of their efforts and aspirations. When they go to school, they are surrounded by other conditions and they are not used to it. Imagine our children who were freed yesterday and now have to follow a certain routine, listen and watch all the time. They should listen and listen to the person in the classroom who constantly talks about what he thinks is fun for the kids.

In higher education, theoretical knowledge is strengthened by practical activities, but even here the whole "world of science" is divided into a number of areas. The scope of traditional knowledge given in such institutions is also limited. The main source of this limited knowledge is teachers and mentors. Thus, these "sources of knowledge" are limited only by their own levels. However, it is important to note that a student may only have a certain knowledge by taking up the lessons that the teacher is providing. However, the student's ability to learn from the teacher also depends on a number of factors, such as the student's academic background, the home and community environment, the general rules of society (for example, "Always listen to your teacher!"), The experiences of our youth, their behavior, etc.

A person may, above all, be respected only by his intellect, knowledge, and ability to do something.

Today, our young people not only get information from their parents, teachers, but also from their

friends, electronic information systems and the Internet. Young people have the ability to absorb a large amount of information. The more educated our children are - the more confident they are in their own strengths and capabilities, the more confident they are in themselves - the more independent they become.

Pedagogical demand for independent learning has a long history. In Europe, its history dates back to the seventeenth century and is closely linked to the work of the famous educator Komeny (Comenius). His work, *Magna Didactica*, provides supportive insights into independent research. For example, "If you go astray, you will lose yourself." In her work, she writes, "Along with teaching and learning, it is important to take appropriate action." Komeny's motto was "Learn by Doing" (this motto has been almost forgotten for the past few centuries).

The results of recent psychologists' research have shown that there is a strong correlation between performance and learning. The fact that human ability to perform and learn constitutes a single unit has been proven in this study. In the last thirty years, human behavior has been the focus of research by these psychologists, and they have called their theories of behavior management.

Behavior management theory is a psychological theory of human behavior. This theory focuses on how a person can set specific goals in his / her mind and what he or she needs to do before achieving them. In other words. The inextricable link between 'doing' and 'learning' constitutes the content of this theory. According to him, the desire and effort to carry out any practical training occurs first and foremost in the human mind. Doing the right thing is evidence of proper thinking. Doing a job means being able to plan specific tasks that are needed to get it done.

To do this, we use cutting-edge pedagogical technologies, that is, through the use of advanced pedagogical technology, we aim to develop students' independent learning activities.

of time-consuming activities that are the driving force behind the progress of the learning process or

the renovation of the teacher's career from a predetermined objective.

Advanced pedagogical technology is the process of designing and designing rational ways for the education system, where the teacher is the key person responsible. Its main task is to communicate information quickly, clearly and clearly to students. Although students are receptive to the news and have a tendency to behave differently, the teacher should teach students to think, reason, and draw conclusions. The main driving force of the student is their reading, reading, drawing, understanding projections and formulas, using the tools, using the tools correctly, helping each other solve problems they have encountered [6, 7].

Changes and changes in the higher education system not only provide students with new knowledge, skills and skills, but also involve the transformation of our youth into themselves and other people, society, state, nature, and the ideas of patriotism. Thus, the activities of our educational institutions should be aimed primarily at the formation of our students in a democratic society, with their own outlook and self-awareness.

The National Program for Personnel Training defines a set of modern requirements for a competitive training teacher, a set of interconnected requirements, a generalized model of the teacher, and the following basic requirements:

- teaching skills;
- the ability to train;
- personal qualities that contribute to the human factor in the educational process;
- the ability to objectively evaluate and control students' knowledge.

Thus, the teacher-teacher must possess the following qualities to carry out the challenging, responsible and urgent tasks for him, and to form new approaches to the educational process:

- a deep understanding of the meaning of modern, scientific and cultural development;
- a deeper and broader understanding of the world and the human knowledge system;

- implementation of information and educational technologies in teaching;
- have an understanding of the Internet and can use it to enhance their knowledge;
- be able to analyze and evaluate the effectiveness of pedagogical work;
- to develop an understanding of family education issues;
- human and national culture and values;
- understanding of national ideas and the essence of national ideology and economic reforms;
- to understand the true nature of new pedagogical technologies;
- know how to effectively use pedagogical technologies in the classroom;
- provide students with the opportunity to think and communicate with each other and to create a friendly environment;
- have mastered the use of laboratory equipment and training to enhance the effectiveness of the lesson;
- know how to use technical means and tools;
- education, training, creativity, initiative and constant work on the development of children as a fully developed human being.

In order to fulfill the above set of requirements for teachers, each teacher needs to develop new thinking, independent learning of pedagogical technologies, and a deep understanding of what their goals and objectives are.

In addition to being knowledgeable about the subject in which he / she is teaching, a faculty member of a higher education institution must know and apply the new pedagogical and information technologies. New pedagogical technologies are the process of designing and designing rational ways of the education system in which the teacher is the main responsible person. Its main task is to communicate information quickly, clearly and clearly to students. Although students are receptive to the news and have a tendency to behave differently, the teacher should teach students to think, reason, and draw conclusions. The main driving force of the student is

reading, reading, writing, understanding formulas, using electric devices, using them correctly, and helping each other to solve the problems they face [7].

The most important features of educational content of pedagogical technologies are:

- a harmonized system of teacher's goals and objectives;
 - Ensure that the teaching process is divided into sections, high level of training, algorithmic activity of students;
 - Creation of pleasant psychological environment;
 - determination of the results of each task;
 - possibility of change of methods of the organization of teaching process, choice of teaching methods;
 - More feasibility of using interactive teaching methods;
 - Prophecy, predictability of results;
 - delivery of information on evaluation criteria in the morning;
 - In the process of editing the process, it is focused not on the student's mistakes, but on the way in which he / she organizes the learning process for each student;
 - underestimation of current control activities and its use as a means of editing feedback and training procedures;
 - the process of training is divided into intermediate objectives and coordinated with the final results;
 - Accuracy and consolidation of student achievements in the field;
 - Completeness of the final assessment tasks with the expected student tasks, ie the expected results from the student's education;
 - Completion of the pedagogical process
- The role of the pedagogical requirements for the design of the content and process of teaching science is important in choosing the pedagogical technology and in designing the maximum number of specifics in the projected pedagogical technology.

Pedagogical requirements for designing the content and process of teaching the subject are the amount of hours required for various subjects (lectures, practical exercises, experiences, etc.) according to the curriculum of the educational process, which is necessary and sufficient for students of this subject. and the content of knowledge, skills and skill sets, the most appropriate pedagogical technology for teaching science, and the form and content of the didactic means that ensure the implementation of this technology. Igan [3, 5].

It is well-known that the curriculum and curricula of all majors in the field of electrical engineering are incorporated into theoretical electrical engineering. The classroom devoted to theoretical electrotechnical disciplines is determined based on the requirements for the knowledge, skills and qualifications of the specialists who will be trained. Requirements for students' knowledge, skills and qualifications in this subject are determined by the nature and specificity of the training of junior specialists.

The curriculum of theoretical electrotechnical disciplines includes the content of the discipline, its structural structure, topics, sequence of topics, type of occupation, teaching methodology and the list of recommended literature.

The aim of the course is to teach students theoretical understanding of the processes of electrical circuits, as well as the basic laws of electrical and magnetic circuits.

Theoretical electrotechnical disciplines are based on the physics sections of the theory of electrical oscillations and waves, electric and magnetic fields, integral, differential and matrix calculations of mathematics, vectors, and complex theory of functions. In turn, the knowledge gained from this subject will be a theoretical basis for the teaching of other specialties in the field of electrical energy.

Teaching theoretical electrical engineering consists of lectures, experiments, hands-on activities, as well as independent work outside the classroom, with the use of non-traditional teaching methods and the use of modern teaching techniques.

Students in Theoretical Electrical Engineering:

- to have knowledge of physical bases of electrical engineering, unchanged, variable and three-phase current circuits, nonlinear electric circuits, non-sinusoidal electric quantities, electromagnetic field theory.

- be able to apply basic principles of theoretical electrical engineering, assemble and measure electrical circuits, to process the results of the experiments on the basis of theoretical knowledge and to test theoretical knowledge in practice.

- Be able to calculate constant, alternating and three-phase current circuits, to calculate transient processes in electrical and magnetic circuits, to calculate linear and nonlinear electrical circuits, and to train.

Electricity is used in all areas of human activities. Manufacturing facilities are mainly driven by electric motors; electrical, nonelectric parameters are measured and controlled using electrical devices and devices. Often modern automated control systems are built on electrical and nonelectric elements. The tremendous importance of electricity in human life is explained by its achievements. Electricity can be generated at large power plants, remotely distributed, and distributed among different consumers. In addition, electricity can be easily converted to other types of energy.

One of the most important aspects of theoretical electrotechnics is to give students an in-depth knowledge of the subject, to encourage them to think freely and to enhance their interest in the subject, science and profession. Because, before studying theoretical electrical engineering, they would be given basic knowledge about electrical circuits and electrical circuits based on their knowledge of physics in the electrical field.

When delivering theoretical electrical engineering to students, it is advisable to pay attention to a specific sequence of topics. Because students cannot explain or explain complex electrical circuits without explaining the basic laws of electric circuits without explaining to students, or they cannot learn the

methods of calculating uninterrupted electrical circuits and complex electrical circuits.

V. CONCLUSIONS/ RECOMMENDATIONS

The main results from pedagogical research are:

The structure of theoretical electrotechnical science was analyzed. It was stated that improving the content of curricula and textbooks in education, identifying its new content, and ensuring that the sections and topics of the learning materials were properly organized are one of the key factors in the educational process.

The content of theoretical electrotechnical science, the peculiarities of teaching the subject were studied. It was noted that linking theoretical electrical engineering to other disciplines is one of the most important features of teaching.

Developed and analyzed the method of conducting practical training on theoretical electrotechnical disciplines in higher educational institutions on the topic "The study of voltage resonance" using traditional and non-traditional (interactive) methods. It was acknowledged that using interactive methods increased the effectiveness of the lesson, that none of the students were indifferent during the lesson, and that students' performance increased significantly.

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