Symposium on Natural and Applied Sciences
Hosted Online from London, United Kingdom
Date: 5th January, 2026
Website: https://econferencia.com

THE ROLE OF DIGITAL TECHNOLOGIES IN THE TRAINING OF FUTURE ENGINEERS

Akhmedov Juraboy
Professor of Jizzakh Polytechnic Institute

Uktamov Davronjon
Independent researcher at Jizzakh Polytechnic Institute
uktamovdavronjonjiz@gmail.com
Phone: +998 88 074 50 54

Abstract
This article discusses the state of use of renewable energy sources in the Republic of Uzbekistan, current issues in ensuring sustainable development in the energy sector, and the problems of improving the system of personnel training in engineering. The authors analyze the didactic conditions for the use of digital technologies in the process of energy education and justify the need to strengthen the integration of education and production.

Keywords: Digital technologies, engineering education, renewable energy, energy efficiency, innovative education, didactic conditions, information and communication technologies.

There are factors that confirm the superiority of digital educational technologies over traditional means in developing the professional competence of future engineers. These factors are divided into didactic, psychological, economic, and physiological groups.

Symposium on Natural and Applied Sciences
Hosted Online from London, United Kingdom
Date: 5th January, 2026
Website: https://econferencia.com

The didactic requirements for digital technologies include: scientificity, understandable, rigorous and systematic presentation (ensuring the possibility of constructing the content of educational activities, taking into account the basic principles of pedagogy, psychology, informatics, ergonomics, and the fundamental foundations of modern science), continuity and integrity (they are a logical consequence and complement of previously learned knowledge), consistency, problematicity, demonstration, activation (the presence of independence and active nature of teaching), consistency in the assimilation of learning outcomes, interactivity of communication, and the unity of teaching, upbringing, development, and practice [1].

Methodological requirements include: taking into account the specific characteristics of a specific academic discipline, taking into account the specificity of a particular discipline, the interdependence, interrelation, diversity, and implementation of modern information methods.

Psychological requirements include perception (verbal-logical, sensory-perceptive), thinking (conceptual-theoretical, demonstrative-practical), attention (perseverance, transference), motivation (active forms of work, high level of demonstrativeness, constant stimulation of high levels of motivation of students through timely feedback), memory, imagination, taking into account age and individual psychological characteristics (taking into account the acquired knowledge, skills and qualifications, ensuring that the content of the subject and the level of complexity of the educational questions correspond to the age capabilities and individual characteristics of students, and protection from excessive emotional, nervous, and mental loads when mastering the educational material) [2].

Didactic factors influencing the development of professional competence of future energy specialists were studied. (Figure 1.1).

Symposium on Natural and Applied Sciences
Hosted Online from London, United Kingdom
Date: 5th January, 2026
Website: https://econferencia.com

The content of didactic factors influencing the development of professional competence of future energy sector specialists

Curriculum: 60710700 The proportionality of the number of teaching hours, the coherence and continuity of the content of the subjects in the curriculum of the educational direction of Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Engineering), and the placement of the subjects based on today's innovative requirements.

Curriculum: The curriculum of the Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Engineering) educational program is designed to be based on the principles of content coherence from simple to complex, interdisciplinary connection and non-repetition in content, and optimization based on integration with the relevant educational content of developed countries.

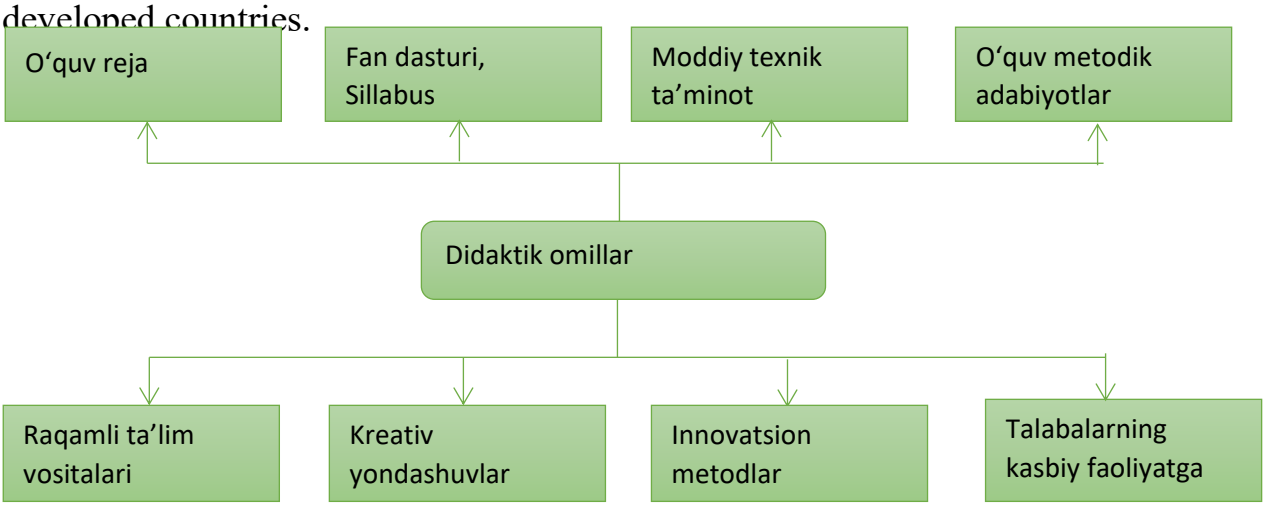

Figure 1.1. Didactic factors influencing the development of competence in innovative professional activities of future energy sector specialists.

Material and technical support: According to unconfirmed statistics, when the material and technical support of higher education institutions is statistically analyzed with the material and technical support of higher education institutions in developed countries, it was found that this process is equal to 14% in our republic . Despite the fact that the topics allocated for laboratory classes in the curricula of the subjects related to the specialty taught in the educational direction "Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Machine Building)" are conducted in laboratory rooms, the material and technical support does not meet today's innovative requirements. The requirements for laboratory rooms of the educational direction "Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Machine Building)" require the development of requirements for laboratory rooms based on international standards [3].

Educational and methodological literature: The provision of educational and methodological literature for subjects in the curriculum of the 60710700 Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Engineering) educational direction is unsatisfactory. The list of literature used in the academic programs of higher educational institutions in the educational direction 60710700 Electrical engineering, electrical mechanics and electrical technologies (electrical engineering) should be formed on the basis of the list of literature recommended for publication in this direction by the Ministry of Higher Education, Science and Innovations of the Republic of Uzbekistan, the Council for Coordinating the Activities of Educational and Methodological Associations in Higher and Secondary Specialized and Vocational Education.

Creative approaches: aligning the quality of training sessions with State Educational Standards, as well as methodologically effective and correct

organization of classes based on methods and tools that serve to ensure a creative, imaginative approach to the process of training future specialist students.

Innovative methods: arouse students' interest in learning, motivate each participant in the educational process, have a positive impact on the psyche of each student, create favorable conditions for the thorough assimilation of educational material, have a positive impact on students' independent learning and motivation for classes, arouse creative thinking and a positive attitude towards topics in students, and form vital skills and competencies in students.

Motivation of students for professional activity: 60710700 Improving the content of the curriculum, academic program, material and technical support, educational and methodological literature of the educational direction of Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Engineering) and increasing the scope of use of software educational tools in the effective organization of classes using innovative methods , based on creative approaches.

The subject of teaching methods of specialized subjects occupies a leading place in the curriculum for the training of pedagogical specialists in the technical field. It indicates the subjects necessary for future specialists in electrical engineering, electrical mechanics and electrical technologies (electrical engineering) to become qualified engineering personnel, the educational tasks of teaching, the horizontal and vertical continuity of the subjects being taught with other subjects, and their production practices that should be carried out in conjunction with education. Teaching methods of teaching specialized subjects should be carried out in lectures, practical and laboratory classes, along with ideological-political, educational-educational methods, modern methods and means of improving the quality and efficiency of teaching, rational organization of the educational process, and activation of students' learning [4].

Symposium on Natural and Applied Sciences
Hosted Online from London, United Kingdom
Date: 5th January, 2026
Website: https://econferencia.com

The process of teaching specialized subjects should be carried out by demonstrating various types of visual aids, exercises, examples, and the use of programs, with the integral connection of these activities. It is also necessary to use modern electrical teaching aids, programs, filmstrips, slides, films in the field of energy, educational and control computers, as well as their programs and manuals.

In modern socio-economic conditions, an important condition for improving the professional training of future energy sector personnel is the organization of an educational system based on the achievements of modern science, technology, and engineering [5].

One of the urgent tasks facing the education system today is the widespread use of modern pedagogical technologies and achievements in teaching, their introduction into the education system, and the application of the experiences of developed countries to our country's education system.

The quality of training qualified specialists in educational institutions is largely determined by the effective teaching of specialized subjects. The fact that specialized subjects are more practical in their study and are considered closer to production indicates that they are different from humanities and natural sciences. Production practices are carried out in conjunction with specialized subjects. The selection of teaching methodologies and setting educational goals in specialized subjects also requires specificity. The leading component of specialized subjects is “Methods of Activity”. Therefore, it is necessary to conduct a deep didactic analysis in developing digital educational literature in specialized subjects and determining the content of education related to this , organizing the educational process, and choosing effective teaching methodologies.

The didactic possibilities of using digital educational tools in the effectiveness of the education system are determined by the following circumstances :

Symposium on Natural and Applied Sciences
Hosted Online from London, United Kingdom
Date: 5th January, 2026
Website: https://econferencia.com

1. Teaching based on digital learning tools opens up opportunities for students to access non-traditional sources of information, increases the efficiency of independent work, and creates broad opportunities for engaging in creative activities.

and their complex to achieve the set methodological goals , that is, to create the necessary educational environment. When using digital educational tools of teaching, the teacher has the opportunity to make changes and additions based on the conditions of computerized teaching and control programs.

3. As a result of the use of digital educational tools for learning based on use in an automated educational and information system, teachers not only increase their level of information literacy, but also gain access to information from almost the entire world [6].

Digital learning tools are didactic tools designed to partially or completely automate the learning process using computer technology. They are considered one of the promising forms of increasing the efficiency of the educational process and are used as a teaching tool based on modern technologies. Pedagogical software tools are created using programs that implement effects such as dynamic illustrations, sound processes, animations, etc. Digital educational tools are divided into the following types: educational programs , test programs, exercisers, programs that create a virtual learning environment with the participation of a teacher.

auxiliary tools aimed at achieving specific didactic goals in the subject .

Specialized disciplines cover processes that directly provide in-depth, thorough knowledge, and develop relevant skills and competencies in specific areas of production , reflecting specific specialized characteristics.

include disciplines and their parts that directly reflect the specific characteristics of activities in various sectors of the national economy: agricultural sectors,

industrial production enterprises, mechanical engineering, transport, communications, folk crafts, areas of culture and art, and other areas.

The introduction of advanced technologies, new techniques, and scientific achievements into production has a significant impact not only on the development of certain sectors of the national economy, but also on the development of all sectors (construction, mechanical engineering, agriculture, energy, industry, communications, services , and others), as well as on management, organization, and economics.

Therefore, the changing and updating of techniques and technologies requires each specialist to have a broad outlook and deep knowledge, as well as the ability to perform several different tasks.

Specialized subjects are divided into the following groups according to their content and essence:

1. Specialized subjects in which the educational material covers issues related to technology. These include educational materials that cover the structure, operating principles, repair and operating rules of machines and equipment used in the production of products and the labor process, their design improvement, calculation, design, automation; the structure of labor tools, devices, instruments and their parts; methods and techniques for installing, assembling, repairing, and adjusting machines and equipment that are objects of labor; modern methods of restoring and repairing mechanisms and parts, structures and operating procedures of automatic systems and experimental devices.

2. Specialized subjects, in which educational materials cover issues related to the technology of product production. These include technological and labor processes that characterize the integrity of a particular specialty, the design and complex mechanization of technological processes, automation, design of production enterprises, the introduction and development of new technologies,

their implementation, control and management; scientific research and experimentation, safety rules, industrial sanitation and hygiene, and the basics of labor legislation.

3. The educational material includes specialized subjects that cover issues related to raw materials. These include educational materials that cover the experimental determination of the physical and chemical properties, mechanical and technological properties of various materials and raw materials used in production, and the technology of their preparation. It also includes educational materials that focus on the processes, calculations , and experimental research in the processing of raw materials .

Specialized subjects that include educational materials on the organization, management and economics of production. This group includes educational materials (foundations of production, labor organization and economics) studied in the training of qualified specialists in all specialties , organization, management, management of the economy and production, information technologies, the use of advanced methods, etc.

Teaching specialized subjects differs sharply from the humanities and natural sciences in many of its characteristics, namely, content, goals and objectives, methods, means, organization, place of conduct, equipment, forms, structure, and allocated time [7]. Necessary to organize laboratory-practical exercises that form specific skills such as drawing, tabulating, calculating and measuring, as well as production exercises that help to directly visualize techniques and technology . It requires students to have a certain level of skills and qualifications in their specialized specialty. Therefore, the development of educational and methodological support for the specialty disciplines of the educational direction 60710700 Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Engineering) requires a unique approach to organizing

the educational process, choosing effective teaching methods, and determining the content of education.

The purpose of conducting scientific research is to study the features of teaching and learning of the specialty disciplines of the educational direction 60710700 Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Engineering), to develop and apply effective methods, to determine their pedagogical effectiveness, and to solve issues related to the use of didactic tools in the educational process. To conduct scientific research, the teacher is required to have a deep knowledge of the content of the specialty disciplines of the educational direction Electrical Engineering, Electrical Mechanics and Electrical Technologies (Electrical Engineering). Many future teachers are engaged in pedagogical research from their student days. They prepare methodological guidelines, models, and materials for independent work on a particular specialty discipline . They improve their pedagogical skills by participating in scientific conferences and seminars in the field of energy.

Theoretical method - includes the study and analysis of literature relevant to the field of electrical engineering, electrical mechanics and electrical technologies (electrical engineering), as well as research based on pedagogical experiments. When working on literature, books and magazines, articles and patents, scientific developments, collections and catalogs, and information from the Internet are used.

Observational method - usually used to monitor students' learning through natural observation, to take into account changes in their behavior and attitudes, and to determine ways to provide appropriate educational and educational influence.

The interview method, being a type of questioning , requires serious preparation from the researcher, as it is used in the form of a verbal conversation during direct

contact with a person, in the form of free speech without writing down the interviewee's answers.

Studying students' creativity - analyzing factors related to their unique individual activities and drawing conclusions .

The pedagogical inquiry method is the process by which a researcher obtains information from other people about some aspect or phenomenon of pedagogical experience. Questioning implies a logically thought-out system of questions, their clear formulation, and their relative scarcity (3-5). It may also require a definitive answer ("yes", "no"). Tests, questionnaires - this is a questionnaire, that is, a questionnaire is used to determine the novelty of the created scientific hypothesis, to find out the individual or group opinions, views of students, what professions they are interested in, their dreams and aspirations for the future , and to draw appropriate conclusions and make recommendations.

of the test questions is to comprehensively assess students' knowledge in a short period of time and level of specialists is to conduct a test using a test.

Testing with the help of a test allows you to immediately determine or assess the knowledge, spirituality of a student or specialist, as well as the direction and specialty of young people, their abilities. Some of the achievements and shortcomings of assessing knowledge with the help of a test from a pedagogical point of view are presented, and the possibility of automating the assessment process using computers is emphasized. The attractiveness of test questions and issues is due to their brevity and conciseness, the presence of the correct answer among the general answers and their ability to serve as a guide for students, their similarity to a riddle game, and the use of memory, intuition and ingenuity in finding the answer. Developing test questions (questionnaires) is a complex scientific process. Ultimately, the reliability of the research results depends on the content of the questionnaires, the form of the questions asked, and the number

of completed questionnaires . Usually, the data for test questions are compiled on a computer based on the ability to work with mathematical statistical methods. Sociology research method - questions are entered into the questionnaire. The purpose of this is to determine the attitude of students and young people to the specialty, to know the friendships between students, the conditions in educational institutions, to determine the achievements and shortcomings, the relationship between young people, their interest in religion, especially mysticism, the level of students' spiritual qualities, their desire to learn, the level of provision with literature, the distribution of education, the level of teacher training, the quality of textbooks, the types of computer training, the type of training to improve scientific and professional skills, the public place where students often engage, the place of residence, the factors influencing the formation of a scientific worldview, the decisive factors in becoming a specialist, the process of students' level of consciousness, the spiritual qualities necessary to become a complete person, the level of mastery. All questions and answers are processed on a computer and conclusions are drawn.

REFERENCES

1. Uktamov D.O. Regulatory and legal framework for the use of digital technologies in the educational process. Collection of materials of the "International Scientific and Technical" conference on computer science and engineering technologies No. 2 October 13, 2023, 339-342.
2. Uktamov D.O. The role and importance of digital technologies in preparing future engineers for professional activity . Scientific Methodological Journal 2024 No. 2/2 131-136.

3. Uktamov D.O. Methodological system for using digital technologies in training future engineers. Professional education in Uzbekistan 2024 No. 1, 52-58.
4. Akhmedov J.R, Nurov U.X, Uktamov D.O. Technological map of the methodology for preparing engineering and pedagogues for innovative activities in an informational educational environment . International scientific and practical online conference "Computer linguistics: problems and solutions" . - Tashkent. 19.04.2021. Pages 29-36.
5. Uktamov D.O. Digital educational technologies as a means of preparing future engineers for professional activity. Innovative technologies in the environment of digitalization of higher education: Problems and solutions International scientific and practical conference March 14-15, 2024 105-109 .
6. Hamidov J.A, Murodova A.Y. (2023) Technology for development of professional and technical component of future engineers through virtual educational technology Atamuratov RK The educational advantages of virtual reality technologies. The Competing Science and Technology International Journal, 4 May 2023, pp. 87-90.
7. Murodova A.Y. (2023) Virtualization in the training of engineers as a factor of increasing scientific efficiency. Academic Research Journal 2023. Pages 184-189.