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Technical training of bachelors in the energy sector is based on many theoretical principles, including:

1. Systemic approach. Taking into account all components of the energy system - from generating capacities to end energy consumers. This allows students to build a holistic understanding of the functioning of energy processes and systems, which is the basis for their professional activities.

The systemic approach in technical training of bachelors in the energy sector consists in considering energy processes, technologies and systems as interconnected and interacting elements that form a single holistic structure. This approach allows students to see not only individual components of energy systems, but also to understand their relationships, interaction and impact on the overall efficiency and reliability of energy processes.

The main aspects of the systemic approach:

1. System integrity. Within the framework of energy, the systems approach consists in considering energy facilities not as isolated parts, but as parts of a single energy system. For example, when designing and analyzing the operation of a power plant, all aspects of its functioning are taken into account: from energy generation to its transmission to consumers. This also includes issues of energy conservation and environmental protection.
2. Interconnection of system elements. Students study how various elements of the energy infrastructure interact with each other. These can be generating capacities, transmission networks, automation and control systems, energy consumers. Understanding such relationships helps future specialists make optimal decisions in conditions of variable parameters or malfunctions.
3. Feedback processes. In energy systems, the use of feedback mechanisms is important to maintain stability and efficiency. For example, in electrical networks, automatic control systems based on load data can adjust the operation of generators or regulate voltage, ensuring a stable supply of energy. Feedback is also important for optimizing the operation of technological equipment and detecting and eliminating emergency situations.
4. System dynamics analysis. The systems approach allows you to assess not only the static state of the energy system, but also its dynamics, that is, how it changes over time, how it responds to load changes, faults or external conditions. This helps students understand the importance of monitoring and forecasting to ensure the reliability and efficiency of energy systems.
5. Optimization and efficiency. Using a systems approach allows you to develop strategies to improve the efficiency of energy systems. This may include optimizing the

distribution of energy between different types of generating capacity, introducing new technologies such as renewable energy sources, or upgrading existing system elements to reduce energy losses or improve its quality.

6. Modeling and simulation. In educational settings, the systems approach actively uses modeling and computer simulation methods to study complex energy processes. Using mobile Internet devices, students can use specialized applications to model the operation of energy systems, assess their efficiency and safety in various conditions.

7. Adaptability and stability of the system. Energy systems must be not only efficient, but also adaptable to changes. The use of a systems approach allows us to take into account factors that affect the stability of the system, in particular changes in energy consumption, various external influences (for example, natural disasters or man-made accidents), and to develop methods for their prediction and adaptation.

The use of mobile technologies allows students to gain access to modern tools for analyzing and modeling energy systems. Through mobile platforms, it is convenient to use simulations to study complex processes in energy networks, which allows students to conduct various scenarios of system operation in real time and study the effectiveness of various solutions. Mobile devices also allow the use of technologies for monitoring and analyzing data in real time, which is necessary to maintain the stability of energy systems.

Thus, the systems approach provides comprehensive, integrated training for students, allowing them to see all elements of energy systems in their interrelationships and prepare to solve complex engineering problems in the energy sector.

2. Interdisciplinarity. An important aspect is the interaction of different disciplines: electrical engineering, energy technologies, automation and computer science. This allows for the creation of integrated approaches to solving energy system problems.

Interdisciplinarity is an important element of the training of bachelors in the energy sector, since modern energy systems and technologies require an integrated approach that includes knowledge from various sciences and disciplines. Technical training of specialists in the energy sector is not limited to knowledge of electrical engineering or mechanics - it should cover various aspects that are directly or indirectly related to energy and combine them into a single system of knowledge.

The main aspects of interdisciplinarity in the training of bachelors in the energy sector:

1. Electrical engineering and energy technologies. The basic disciplines are electrical engineering, the theory of electrical circuits, electrical machines and devices, which are the basis for understanding the principles of operation of energy systems. However, this knowledge should be supplemented by engineering aspects of designing energy networks, generating and distributing energy, as well as assessing the efficiency of energy installations. Therefore, students should also know the principles of operation of various energy technologies - from traditional to renewable energy sources.

2. Mechanics and thermodynamics. Energy processes, especially in thermal and hydraulic systems, are impossible without understanding the laws of mechanics and thermodynamics. The principles of thermodynamics are important for calculating the efficiency of heat transfer, the operation of boilers and turbines. This knowledge is the basis for creating energy-efficient and environmentally friendly systems, as well as for developing new technologies in the energy sector.

3. Automation and information technologies. For effective management of energy systems, it is necessary to implement process automation. This includes both programming and use of automatic control tools, and the development of software for monitoring and analyzing energy processes. Information technologies for collecting, processing and transmitting data in real time also play an important role in this, which allows for forecasting and optimizing the operation of energy systems.

4. Ecology and energy saving. In the context of modern requirements for energy systems, special attention is paid to the environmental aspects of energy. Students should study not only ways to reduce carbon dioxide emissions and other pollutants, but also the principles of energy efficiency, which include the rational use of resources, modernization of equipment and the use of renewable energy sources, such as solar and wind energy.

5. Economics and management of energy systems. In a market economy, the management of energy companies, energy production and distribution requires knowledge in the fields of economics, finance and management. Students should be familiar with the issues of planning energy projects, assessing their cost, financial aspects of energy investments, as well as risk management in the energy sector.

6. Law and energy policy. Studying the legal aspects of the functioning of energy markets, legislation on the security of energy systems and energy policy at the state level is an important part of specialist training. This knowledge allows future engineers to understand not only technical aspects, but also legal requirements for safety, environmental protection and consumer rights.

7. Innovative technologies and digital solutions. The application of interdisciplinary approaches in education also includes the use of the latest technologies, such as the Internet of Things (IoT), Big Data, artificial intelligence (AI), blockchain and other digital technologies. These technologies allow for improving the processes of managing energy systems, monitoring the condition of equipment, forecasting energy consumption and optimizing costs.

Mobile Internet devices play an important role in implementing an interdisciplinary approach. Thanks to mobile technologies, students have access to numerous resources for integrating knowledge from different disciplines:

- mobile applications for calculations and modeling allow you to perform technical and economic calculations, analyze energy systems, and also simulate their operation under various conditions;
- the use of online platforms makes it possible to combine theoretical and practical knowledge, working with materials from different areas: from ecology to process automation;

– interactive laboratories on mobile devices allow students to conduct research and experiments in various branches of energy, which is necessary to create an idea of the integration of theoretical knowledge into practical activities;

– distance learning and consultations through mobile applications and platforms provide continuous access to knowledge from various disciplines, contributing to a deeper mastery of the material and the development of interdisciplinary skills.

An interdisciplinary approach is necessary for the training of highly qualified specialists in the field of energy, since modern energy systems are complex and include many different aspects. Integration of knowledge from different disciplines - from technical to economic and environmental - allows students to create a holistic understanding of energy processes and prepare them to solve complex problems that they will encounter in their professional activities.

3. Innovative technologies and digitalization. Training students taking into account the latest achievements in the field of energy, such as smart grids, intelligent control and automation systems. The use of new technologies contributes to the formation of students' skills in working with modern tools and devices.

Innovative technologies and digitalization are one of the main drivers of the development of the energy industry and technical training of bachelors in energy specialties. Modern energy systems require the integration of advanced technologies to increase their efficiency, reliability and environmental safety. Digital tools and innovative technologies contribute to the optimization of energy network management, process automation and reduction of environmental impact.

The main aspects of the implementation of innovative technologies and digitalization in the training of bachelors in the energy sector:

1. Smart Grids. The development of smart grids is one of the main directions of digitalization of energy systems. They allow to integrate traditional energy sources with renewable ones, improving the efficiency and reliability of energy supply. Students should study the basics of design and operation of smart grids, as well as the principles of their automatic control, based on the use of sensor technologies, communication protocols and real-time data.

2. Internet of Things (IoT) in energy. The Internet of Things (IoT) is actively implemented in energy systems to monitor and control various components of energy networks. With the help of IoT, it is possible to collect data from distributed sensors and devices, such as energy consumption meters, generating stations, transformers, etc. This data is transmitted to centralized systems, which allows for analysis and forecasts of load, energy losses, as well as prompt detection of malfunctions. Students should be familiar with IoT technologies, learn how to configure and analyze such systems, and understand the importance of data security within this technology.

3. Big Data and Data Analytics. The energy industry actively uses big data methods to process and analyze huge amounts of information coming from various sources. This can be data on the state of energy networks, equipment operating parameters, energy demand forecasts, as well as weather data for predicting energy

production from renewable sources (sun, wind). Students should gain skills in working with big data, using modern software tools for their processing and analysis, and learn to apply the obtained data to optimize the operation of energy systems.

4. Artificial Intelligence (AI) and Machine Learning. The integration of artificial intelligence and machine learning technologies into energy systems allows you to improve energy consumption forecasts, optimize the operation of energy installations, and automate management processes. For example, machine learning algorithms can be used to predict peak loads or determine the optimal operating modes of equipment. They are also used to analyze data from monitoring systems and to identify potential problems, such as damage or reduced efficiency of equipment. As part of the training of students, programming skills, understanding the principles of machine learning algorithms and artificial intelligence are important.

5. Blockchain in energy. Blockchain technologies can be used to ensure transparency and security in energy networks. In particular, they allow you to track energy supplies, control transactions with energy assets, and automate settlements between energy suppliers and consumers. Using blockchain to ensure transparency in energy transactions reduces the risks of fraud, as well as improve the efficiency of energy distribution. In the educational process, students should familiarize themselves with this technology and its potential applications in the energy industry.

6. Renewable energy sources and digital technologies. Digitalization of energy systems allows for the effective integration of renewable energy sources (solar panels, wind turbines, bioenergy plants, etc.) into general energy networks. The use of digital platforms allows for the collection of data from such sources, forecasting their performance, and ensuring integration with traditional energy sources, which allows for increased stability of energy systems.

7. Digital Twins. The concept of digital twins involves the creation of a virtual copy of a real energy system or its element. These digital models allow for simulations of system operation, testing various scenarios, optimizing energy processes, and planning measures to improve efficiency or repair equipment. The use of this technology in education gives students the opportunity to model energy processes, gain practical skills in working with modern tools for optimization and forecasting.

Mobile Internet devices are an important tool for introducing innovative technologies into the educational process. Using smartphones and tablets, students can access real-world data on energy systems, perform modeling, use online services to analyze and forecast energy needs, and participate in virtual labs and simulations. Some of them are:

1. Mobile applications for modeling energy systems allow students to implement scenarios, conduct analyses and calculations in real time, working with data coming from energy facilities.

2. Interactive learning platforms allow students to access online courses, simulations and simulators that improve understanding of complex technological processes.

3. The use of virtual and augmented reality (VR/AR) for modeling complex energy processes allows students to experience processes on a real scale, which helps to better assimilate the material.

Innovative technologies and digitalization significantly improve the educational process in the preparation of bachelors in the energy sector, allowing students to master the latest technologies used in real production. They contribute to the development of important skills necessary for managing modern energy systems, optimizing energy use, ensuring environmental safety, and implementing innovative solutions in the energy sector.

2.2. Methodological Principles of Technical Training of Bachelors in the Energy Industry Using Mobile Internet Devices

The methodological part of technical training should focus on the integration of the latest technologies into the educational process. The use of mobile Internet devices, in particular smartphones, tablets and laptops, allows you to significantly expand the capabilities of students in independent work, research and application of knowledge in practice.

Here are some key methods:

1. Electronic platforms and online courses. The use of online learning platforms provides access to lectures, laboratory work, technical tasks and tests, which ensures flexibility and accessibility of training for students.

Electronic platforms and online courses are important tools in the process of training bachelors in the energy sector, as they provide access to a wide range of educational materials and the ability to study at any time and in any place. They contribute to the integration of traditional teaching methods with the latest technologies, increasing the efficiency of the educational process and providing students with the necessary knowledge in various aspects of the energy sector.

The main advantages of using electronic platforms and online courses:

1. Access to a variety of resources and materials. Online courses and platforms allow students to access a large number of educational materials: lectures, videos, presentations, tests, electronic textbooks, articles, scientific studies and other literature. This allows for a more in-depth study of energy topics, mechanisms, theories and methods used in various sub-sectors of the energy industry (renewable energy, energy efficiency, automation, etc.).

2. Flexibility of learning. Online courses give students the opportunity to study at a time convenient for them. This is especially important for those who work or have other responsibilities. Platforms often offer the opportunity to choose topics, which allows students to independently form a study schedule, as well as focus on individual aspects of energy technologies that interest them most.

3. Interactivity and practical tasks. Online platforms often include interactive learning elements: simulations, tests, video lessons with feedback, discussion of topics through forums, chat rooms with teachers or other students. These tools help students

learn the material, apply knowledge in practice, and receive instant feedback on the correctness of the tasks.

4. Use of virtual laboratories and simulations. Online platforms provide the opportunity to work with virtual laboratories, which is especially useful for studying energy systems and processes. Students can conduct virtual experiments with energy installations, energy network models, or renewable energy technologies. This allows them to gain practical experience without having to work with real systems, which can be expensive or difficult in an educational institution.

5. Increasing access to global knowledge. Online courses give students access to materials from leading universities, research centers, and companies around the world. International platforms such as Coursera, edX, FutureLearn provide courses from educational institutions such as MIT, Stanford, University of London, etc. This allows students to gain knowledge on par with best practices and the latest achievements in the energy industry.

It is also necessary to consider key aspects of the use of electronic platforms and online courses in the training of bachelors in the energy industry:

1. Fundamentals of Energy and Renewable Energy Sources. It is very important for bachelors in the energy sector to know the basics of energy, as well as to work with advanced technologies of renewable energy sources, such as solar, wind, hydro and bioenergy. Courses that teach students to design and evaluate energy installations, as well as understand the basics of integrating such sources into existing energy networks are important.

2. Energy efficiency and energy resource management. Modern energy requires the implementation of energy saving technologies and increasing energy efficiency. Students must learn tools and methods for analyzing energy costs, as well as know how to optimize energy use processes. Online courses on energy efficiency provide knowledge for analyzing energy consumption and implementing measures to reduce energy costs.

3. Digital technologies in energy (Big Data, IoT, AI). The digitalization of energy systems is becoming a necessity. Online courses on Big Data, Internet of Things (IoT), Artificial Intelligence (AI) for Energy help students gain skills in data processing, modeling of energy systems and automation of processes in the energy sector. Knowledge of digital technologies allows future specialists to solve problems of optimization, security and forecasting in energy networks.

4. Management and economics of energy projects. In the modern world, energy requires not only technical specialists, but also economists and managers who can effectively manage energy projects. Online courses on project management, economics of energy markets, finance of energy companies give students the opportunity to get acquainted with the basics of management and economic processes in the energy sector.

5. Interactive laboratories and simulations for practical training. Mobile applications and interactive platforms allow students to conduct virtual research, simulate the behavior of energy systems under various conditions. Through

simulations, they can learn to respond to unforeseen situations (such as power outages) and work with real data.

Today, the following are the most common electronic platforms for training in the energy industry:

– Coursera is a platform that offers courses from leading universities in the world. It has courses in energy technologies, renewable energy sources, energy resource management;

– edX is another popular platform for online education that offers certificates and diplomas in energy, digital technologies, energy efficiency4

– Udacity is a platform that specializes in programming and data analytics courses, has programs that focus on the use of big data and AI in energy;

– FutureLearn is a platform that offers courses in innovative technologies, energy policy, renewable energy sources.

Electronic platforms and online courses significantly enrich the process of training bachelors in the energy sector, providing access to modern teaching methods and up-to-date knowledge. They give students the opportunity not only to acquire theoretical knowledge, but also to practically apply it through simulations, interactive laboratories and online experiments. These tools are indispensable in the context of digitalization of energy systems and contribute to the development of modern specialists ready to work in the rapidly changing world of energy.

2. Mobile learning applications. The use of specialized programs for simulations, modeling of energy processes and systems allows students to visualize complex technical concepts and effectively use theoretical knowledge in practice.

Mobile learning applications are an important element in the educational process, in particular in the training of bachelors in the energy sector. They provide access to educational materials, allow students to study anywhere and at any time, and also promote interactive and practical learning. The use of mobile applications makes it possible to integrate technologies that help to better understand energy processes and improve practical skills necessary for work in modern energy.

The main advantages of mobile applications for training in the energy industry:

1. Accessibility and convenience. Mobile applications allow students to access educational materials regardless of time and place. This is especially important for students who have a busy schedule or are unable to be in an educational institution all the time. Mobile applications provide the opportunity to view lectures, complete assignments, take tests, and even participate in virtual laboratories, wherever students are.

2. Interactive learning. Mobile applications allow students to actively interact with educational content, which increases the effectiveness of learning. Thanks to interactive elements (for example, videos, tests, tasks, games, and simulations), students can better understand complex concepts of energy systems, such as renewable energy sources, energy efficiency, and energy network management. Interactivity ensures deep learning of the material and activates the learning process.

3. Personalization of learning. Mobile applications allow you to individualize the learning process, adapting courses and assignments to the needs of each student. Students can choose topics that interest them most and take courses at their own pace. This is important for students who want to study certain aspects of energy technologies in depth or have different levels of training.

4. Increasing motivation through gamification. Many mobile learning applications use gamification, which allows you to turn the learning process into an interesting and exciting game. Students receive points for successfully completing tasks, completing levels, earning awards and achievements. This approach increases motivation for learning and contributes to improving results.

5. Mobility and collaboration. Mobile applications allow students to work in a team, exchange ideas, discuss tasks through chats and forums, which develops communication and collaboration skills. This is especially important in the energy industry, where teamwork and interdisciplinary cooperation are key aspects of professional activity.

The main types of mobile applications for training in the energy industry are:

1. Mobile applications for learning the basics of energy. These applications contain basic information on energy systems, energy conservation, renewable energy sources and energy policy. For example, applications can include interfaces for learning electrical network diagrams, the principles of solar panels or wind turbines. Students can receive short lessons, take tests and complete interactive tasks to consolidate knowledge.

2. Mobile applications for modeling energy processes. To gain a deeper understanding of how energy systems work, students can use mobile applications that allow them to create models of energy networks or analyze energy flows in real time. Such applications can be useful for students studying energy management, planning or automation. For example, applications for modeling hydroelectric power plants or wind farms allow students to see how various factors (wind, solar activity, network load) affect the efficiency of systems.

3. Mobile applications for monitoring and analyzing energy consumption. These applications enable students to track energy consumption in real time, analyze data, and optimize energy use. Such applications are important for learning about energy efficiency, especially in the context of industrial and residential buildings. Students can learn how to use these applications in practice to monitor energy consumption, detect anomalies, and optimize energy costs.

4. Mobile applications for learning about renewable energy sources. Given the popularity of renewable energy sources, many mobile applications focus on learning about these technologies. Such applications can include virtual simulators for designing and evaluating the efficiency of solar panels, wind turbines, or bioenergy plants. Students can learn how to properly select and configure energy systems to maximize the use of renewable energy sources in different conditions.

5. Mobile applications for learning about energy management. These applications can teach students about energy resource management, energy project

planning, energy cost calculations, and the economic aspects of energy technologies. They can also help in the analysis and optimization of energy processes in real conditions through scenario modeling. For example, applications can contain tools for planning energy projects, calculating the efficiency of using different energy sources.

6. Gamification applications for energy education. Applications using gamification can include various games that allow students to develop skills in managing energy systems, make important decisions in energy projects and receive rewards for success. Such applications increase interest in learning and help students remember the material better.

Examples of mobile applications for energy education:

1. Solar Energy – an application for studying the principles of solar panels and assessing their efficiency depending on different environmental conditions.
2. Energy3D – a mobile application for modeling solar electric systems and planning their location on the territory.
3. Wind Energy – an application that allows you to calculate the optimal location of wind turbines for maximum energy collection in different climatic conditions.
4. EnergyHub – an application for monitoring energy consumption in buildings, which helps students analyze and optimize energy costs.

Mobile learning applications are a powerful tool in the training of bachelors in the energy sector, giving them the opportunity to study complex concepts, model energy processes and gain practical skills using modern technologies. They allow you to conveniently combine theoretical training with practical tasks, developing key skills for future professional activities in the energy sector.

3. Interactive learning methods. Thanks to the use of mobile devices, you can actively use interactive tasks, real-time laboratories, which allows you to create a more effective and interesting educational atmosphere for students.

Interactive learning methods are an important tool for increasing the efficiency of education, in particular in the training of bachelors in the energy sector. These methods allow you to actively involve students in the learning process, promote the development of critical thinking, develop communication and cooperation skills, and also help to better assimilate the material through practical tasks and real scenarios.

Advantages of interactive learning methods:

1. Active involvement of students. Interactive teaching methods contribute to the active involvement of students in the learning process, as they have the opportunity not only to listen to lectures, but also to participate in discussions, problem solving, and also to carry out practical exercises. This stimulates greater interest in learning, which increases the level of assimilation of the material.
2. Development of critical thinking. Interactive teaching methods contribute to the development of critical thinking, as students have the opportunity to evaluate different solution options, analyze situations, consider problems from different points of view and make informed decisions. This is extremely important in the energy industry, where in order to effectively solve problems, it is necessary to be able to take into account many factors and possible consequences.

3. Formation of cooperation skills. The use of interactive teaching methods, in particular group tasks, project work, discussions and role-playing games, develops the ability to work in a team. In the energy industry, it is often necessary to work in interdisciplinary teams, where it is important to interact with colleagues from different professional areas (engineers, economists, managers, etc.). Therefore, the ability to collaborate effectively is critical.

4. Deeper learning. Interactive learning allows for the use of different methods and approaches to learning, which helps improve understanding and retention. For example, through simulations of energy processes, students can better understand complex mechanisms and concepts, such as optimizing the operation of energy networks or managing energy resources.

5. Adaptation to individual student needs. Interactive methods allow you to adapt the learning process to the individual needs of each student, since interactive exercises and tests can be used to assess the level of knowledge and adjust the further learning process. Students who need additional help can receive individual tasks or consultations, and more prepared students can solve more complex tasks.

Types of interactive teaching methods for bachelors in the energy industry:

1. Simulations and virtual laboratories. Simulations are one of the most effective interactive methods in teaching the energy industry. With the help of special programs and platforms, students can conduct virtual experiments, changing the parameters of energy processes and observing how these changes affect the result. This allows not only to understand theoretical principles, but also to gain practical experience, which is important for further professional activities. That is, students can simulate the operation of wind turbines or solar power plants, changing environmental parameters, power or energy consumption levels, which allows them to better understand their efficiency in different conditions.

2. Role-playing games and management simulations. Role-playing games and simulations, in which students perform specific roles in energy projects (for example, project manager, engineer, economist), provide an opportunity to practice management skills, plan energy projects and analyze different scenarios. This helps students develop strategic thinking and a deeper understanding of the relationship between technical, economic and environmental aspects of energy projects. That is, students can participate in simulations where they make decisions about the development of energy networks, the choice of optimal energy sources for a particular region or country, taking into account economic, technical and environmental factors.

3. Group projects and collective tasks. Group projects are an important interactive learning method, as they allow students to work together, exchange ideas and solve real problems. In the energy sector, such projects may include the development of energy consumption optimization plans for specific enterprises or cities, the design of energy systems using renewable energy sources. That is, groups of students can work on creating an energy efficiency plan for a large industrial enterprise, using modeling and analysis tools.

4. Discussions and debates. Discussions and debates allow students to express their opinions, develop arguments, and critically evaluate different approaches to solving problems in the energy sector. Such learning methods stimulate the development of communication and public speaking skills, which are important in the professional activities of energy specialists. That is, students can discuss issues related to energy policy, such as the impact of renewable energy sources on energy markets, or ethical issues in the energy sector.

5. Testing and interactive tasks. Interactive tests and tasks can be used to test students' knowledge at each stage of learning. With the help of such tasks, students can evaluate their progress, receive instant feedback and understand where they need to improve their knowledge. This also gives teachers the opportunity to adjust the learning process depending on the results of the tests. That is, students can take tests on energy efficiency, where they need to choose the optimal technologies to reduce energy costs at the enterprise.

Examples of using interactive teaching methods in energy:

1. Energy3D – software for modeling solar energy systems.
2. SimCity or other platforms for modeling cities taking into account energy needs and costs.
3. WattzUp – an application for studying the efficiency of energy devices and optimizing energy consumption in real time.

Interactive teaching methods are a powerful tool for training bachelors in the energy sector. They allow you to create a dynamic and engaging learning environment in which students actively work with educational material, develop critical thinking, collaboration skills and management skills. Thanks to interactive methods, students acquire not only theoretical knowledge, but also practical skills, which makes them ready to solve complex tasks in real-world conditions in the energy sector.

4. Virtual and augmented reality (VR/AR). The use of virtual and augmented reality to model complex energy systems and processes gives students the opportunity not only to study theory, but also to conduct experiments in conditions close to real ones.

Virtual (VR) and augmented reality (AR) are innovative technologies that provide significant opportunities for improving the educational process in the energy sector. They allow you to create an interactive learning environment where students can directly interact with educational content, as well as gain experience in virtual or augmented realities that are close to real conditions. Advantages of using VR/AR in education:

1. Immersiveness of the learning process. The use of VR/AR allows you to create an immersive learning environment in which students can “immerse themselves” in real or simulated situations, which significantly improves their skills and understanding of complex energy processes. For example, students can find themselves in the environment of an electrical substation, solar farm or wind power plant, where they can practically interact with technical elements and operations, which gives them real-world experience without the need to physically be at such facilities.

2. Safe learning in difficult conditions. The use of VR in learning allows students to perform learning tasks in conditions that can be dangerous in real life. For example, students can train in managing energy accidents, repair technical equipment or work in conditions of high loads on energy networks. Thanks to VR, you can study emergency situations, simulate the response to various technical problems without risk to health.

3. Realistic modeling of energy processes. AR and VR technologies allow you to create realistic models of energy systems, such as electrical networks, thermal plants or renewable energy sources. Students can not only study the principles of their operation, but also change the parameters of the systems and see how this affects the efficiency or performance of energy plants. This allows you to better understand complex theoretical concepts and study technical features in real conditions.

4. Improving learning motivation and engagement. Thanks to the use of VR and AR, learning becomes more exciting and motivating for students. The ability to work with virtual objects, as well as receive feedback in real time, helps make learning more interesting and effective. Students actively interact with educational content, which increases their interest and contributes to better assimilation of the material.

5. Reducing costs for materials and equipment. The integration of VR/AR into learning allows you to reduce the cost of physical materials, equipment and tools required for practical classes. For example, to model energy networks or energy processes, students can use virtual interfaces that provide effective hands-on training without the need to physically install expensive equipment.

Types of use of VR/AR in education for energy bachelors:

1. Virtual labs and energy system simulations. In virtual labs, students can conduct experiments without having access to real equipment. This allows them to gain practical skills in calculating and configuring energy systems such as solar panels, wind turbines, or thermal plants. With VR, you can simulate different scenarios, such as changing weather conditions or technical failures, and observe how these factors affect the system's operation. For example, students can use VR to simulate the operation of a solar power plant: choosing a location for panels, adjusting the tilt angle to maximize energy collection, etc.

2. Energy network management training. VR systems can be used to train students in managing energy networks, detecting and eliminating emergency situations such as line outages or system overload. They can "be" in situations that are dangerous or extremely difficult to conduct in real life, for example, in the case of natural disasters or major accidents at energy facilities. Example - students can use VR to train in managing the restoration of energy supplies after an accident at an electrical substation, analyzing virtual scenarios and optimizing processes.

3. Augmented reality for studying energy components. Augmented reality allows students to interact with virtual objects by superimposing them on real objects through mobile devices or special glasses. Students can see in real time additional information about the technical characteristics of energy systems, equipment, infrastructure, etc. This makes it possible to better study complex energy processes without the need to access physical models. Example - students can use AR to study the

technical components of solar panels, seeing on the screen of their device how each element of the installation works and how it interacts with other parts of the energy system.

4. Learning through virtual tours and excursions. The use of VR also allows for virtual tours of energy facilities, such as electrical substations, hydroelectric power plants, or large industrial facilities. This allows students to get acquainted with different types of energy installations and understand how they work, even if a physical trip to such facilities is not possible. Example - students can take virtual tours of a hydroelectric power plant, receiving detailed explanations about each stage of energy production, from the operation of turbines to the regulation of water flows.

5. AR for repair and maintenance of energy installations. Augmented reality can also be used to teach repair and maintenance of energy installations. With the help of AR, students can receive step-by-step instructions on performing repair work on real equipment, which ensures high learning efficiency. Example - using AR to teach wind turbine repair, where students receive visual instructions and information about the repair stages while working with real equipment.

Examples of using VR/AR in energy education:

1. ENERGY Lab (VR system for modeling energy processes) – allows students to work with virtual energy installations, training skills in system management and monitoring.
2. Lumen – AR platform for studying the technical characteristics of solar panels and wind turbines using augmented reality.
3. Visibuild (VR) – uses VR to model energy projects, in particular the design and optimization of energy networks.

The use of virtual and augmented reality in education for the training of bachelors in the energy sector provides significant advantages, in particular in terms of providing realistic experience, safe training in complex situations, as well as the opportunity to study energy processes and systems in an interactive and accessible format. VR/AR technologies not only improve the understanding of theoretical concepts, but also give students the opportunity to develop practical skills necessary for effective work in the energy sector.

5. Communication via mobile platforms. The use of messengers, video conferences, forums and chats to discuss technical issues contributes to the development of teamwork, exchange of ideas and feedback between students and teachers.

Mobile platforms have become an important tool for effective communication in the educational process, especially in the context of technical training of bachelors in the energy sector. The use of mobile applications and platforms for communication between students, teachers and other participants in the educational process contributes to the prompt exchange of information, effective feedback, and also improves interaction and organization of the educational process.

Advantages of communication via mobile platforms:

1. Rapid information exchange. Mobile platforms allow for instant information exchange between participants in the learning process. The use of mobile messengers and communication platforms significantly reduces the time for processing requests and responses, which is especially important when solving operational issues related to the learning process or work on energy projects.
2. Accessibility and convenience. Mobile platforms are available 24/7 and do not depend on the physical location of the learning participants. Students can access educational materials, teacher consultations and communicate with colleagues at any time and anywhere, which provides greater flexibility in the learning process. This allows you to maintain the learning process even in conditions of limited time or distance, for example, during online learning or distance courses.
3. The possibility of group discussions. Mobile platforms provide the opportunity to organize group chats, forums and online discussions, where students can discuss various topics, ask questions and receive answers from both teachers and their classmates. This is especially useful in the framework of collective work on projects, where it is important to discuss tasks, share ideas and solve problems together.
4. Quick response to questions and problems. Through mobile platforms, students can quickly get answers to their questions or seek help from a teacher or administration. This reduces delays in the learning process, increasing its efficiency, especially when students work on practical tasks or projects that require constant feedback.
5. Integration with other educational tools. Mobile platforms allow the integration of various learning tools, such as online courses, databases, testing and assignment platforms. Students can access video lectures, self-test tasks, and provide feedback to teachers directly through mobile applications. This makes it possible to systematize learning and ensure its interactivity.

Types of mobile platforms for communication in education:

1. Mobile messengers. Mobile messengers such as WhatsApp, Telegram, or Slack are widely used in educational processes for instant messaging, providing consultations, and organizing group discussions. They allow you to easily create groups by interest or discipline, as well as share files and links. Using Telegram groups for communication between students and the teacher to discuss assignments, projects, or technical problems related to studying in the energy field.
2. Mobile platforms for online courses. Online learning platforms such as Moodle, Google Classroom, or Canvas can be used for communication within the course. They allow students to access lectures, assignments, and tests, and also send their work to teachers for checking and feedback. Using Moodle to conduct tests, assignments, and homework in energy disciplines, where students can receive answers to their questions and grades via a mobile application.
3. Mobile video conferencing platforms. Mobile video conferencing platforms such as Zoom, Microsoft Teams or Google Meet allow you to organize online lectures, seminars, consultations and other interactive classes, which ensures the virtual presence

of students. They allow teachers and students to communicate effectively even in a remote format. Conduct lectures and consultations on energy disciplines via Zoom, where students can ask questions in real time, receive explanations from the teacher and interact with other students.

4. Mobile applications for project collaboration. Mobile platforms for project collaboration such as Trello or Asana are used to manage tasks and projects, organize work in groups, control the implementation of tasks and deadlines. They allow students to conveniently work on joint projects, exchange ideas, identify responsible persons for individual stages of task completion and evaluate progress. Using Trello to organize project work where students can share tasks for developing an energy project, such as developing an energy efficiency plan for a business.

5. Mobile apps for collaborative file sharing. Mobile file sharing apps such as Google Drive, Dropbox, or OneDrive allow students to store, share, and edit documents in real time. These platforms are convenient for collaborative work on projects or for sharing learning materials between students and teachers. Using Google Drive to store shared documents and presentations related to energy research or projects where students can edit and comment on materials in real time.

Examples of mobile platforms used in energy education:

1. Slack is a platform for organizing teamwork and communication, with integration with other educational tools.

2. Moodle is a learning management system for convenient access to materials and assignments, as well as for communication between students and teachers.

3. Microsoft Teams is a platform for video conferencing, organizing group discussions and working together on projects.

Communication via mobile platforms has a huge potential to improve the efficiency of training in the energy sector. It promotes the rapid exchange of information, allows students and teachers to be in touch at any time and from any place, which significantly improves the organization of the educational process. Thanks to mobile platforms, it is possible to create a more interactive, flexible and convenient learning environment, where students can effectively interact with each other and with teachers, receiving the necessary consultations and feedback to achieve high results.

Therefore, technical training of bachelors in the energy sector using mobile Internet devices is an important stage in adapting the educational process to the requirements of the modern world. This allows students to obtain relevant knowledge and skills necessary for effective work in energy systems that are constantly changing and innovatively developing. With the use of mobile technologies, it becomes possible to implement high-quality and accessible training that ensures the development of competencies important for future energy engineers.

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ANNOTATION

CHAPTER 1. INNOVATIVE AND MODERN FOUNDATIONS OF PEDAGOGY AND PSYCHOLOGY

1.1. Liudmila Kashuba, Viktoriia Vdovenko PECULIARITIES OF TRAINING FUTURE TEACHERS FOR THE FORMATION OF SOCIO-ECONOMIC COMPETENCE OF YOUNGER SCHOOLCHILDREN WITH INTELLECTUAL DISABILITIES

A specialist today is a person with broad general and special knowledge, problem-solving, analytical thinking, socio-psychological and socio-economic competence, intellectual culture, able to quickly respond to changes in technology and science that meet the requirements of new technologies that will inevitably be introduced.

Keywords: socio-economic competence, training of future defectologists.

1.2. Iryna Mozul THE PLACE, ROLE AND SIGNIFICANCE OF FOLKLORE MATERIALS IN ENGLISH LESSONS IN A PRIMARY SCHOOL

The article examines the peculiarities of working with folklore materials in English lessons in primary school. It is noted that the use of authentic texts, such as fairy tales, poems, proverbs, and songs, contributes to the development of communication skills, vocabulary expansion, intercultural competence, and students' motivation to learn the language. The author analyzes methods for adapting small folklore genres to the age-specific characteristics of children and suggests interactive tasks for their effective assimilation. Particular attention is given to integrating folklore materials into the educational process, which allows combining language learning with a cultural aspect. The article emphasizes the importance of authentic folklore as a means of enriching students' learning experience.

Keywords: foreign language, English, language training, foreign language competence, folklore resources, folklore materials, small folklore genres, education, teaching, primary school, primary school students, young learners.

CHAPTER 2. Serhii Onyshchenko THEORETICAL AND METHODOLOGICAL PRINCIPLES OF TECHNICAL TRAINING OF BACHELORS IN THE ENERGY INDUSTRY USING MOBILE INTERNET DEVICES

Technical training of bachelors in the energy industry is an important stage in the formation of professional competencies necessary for performing engineering tasks in various areas of energy. In the context of the development of digital technologies and the integration of mobile Internet devices into the educational process, there is a need to update methodological and theoretical approaches to training future specialists.

Keywords: technical training, bachelors in the energy industry, methodological principles, theoretical principles, mobile Internet devices, educational technologies, energy education, digital platforms for learning, adaptive learning, professional training of students.

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