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MODERN METHODS OF TEACHING NETWORK TECHNOLOGIES

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Abstract: The article analyzes research on the problem of shaping individual education using SMART -technologies in higher education the in conditions COVUD-19. The purpose of the article - methodological recommendations for creating an integrated learning environment in educational institutions using SMART-technologies and the Internet of Things (IoT) in the university teaching the subject "Network Technologies", the basic principles of their work and the main features are formed. As research methods, the author used interpretation, comparative analysis, and generalization of the scientific literature on the problem; The example of SMART-technology tools and IoT-Internet of Things tools analyzes the relevance and validity of their use from a didactic point of view, emphasizing the need to constantly improve the learning process with their help.

Keywords: SMART technologies; IoT-Internet of Things; electronic training systems; network technologies; SMART tutorial.

Introduction:

Today, the scientific and pedagogical analysis of the activities of educational institutions in the context of COVUD-19 is widely discussed in the world. We analyze research on the problem of shaping individual education using IoT-Internet of Things and SMART-technologies. Internet of things (IoT) is a relatively an emergent technology that facilitate interaction between the real and virtual objects. As it develops and matures, it grows in scale and dimension influences the context of our life such as the education, in particular higher education; this article focuses on a research associated with the predictable impact of IoT in the superior education[1].

The need for highly qualified specialists who are able to freely navigate in rapidly changing socio-economic processes is growing. In various sectors of the economy, the demand for efficient labor resources is expanding, which can ensure the introduction of new technologies for the production of quality goods and the provision of services for which there is a demand from the public. In particular, it should be emphasized the increase in the range of areas of the IT sphere. There is a significant increase in the number of effective pedagogical technologies aimed at

training and retraining specialists whose abilities form intellectual capital in the life of society. This necessitates the active use of modern information technologies using the capabilities of electronic networks, which allow developing, changing and correlating various scientific and methodological materials in an accelerated mode.

Statement of the problem:

In the traditional teaching methods, in the development of theoretical knowledge and practical skills in the field of network technologies taught in pedagogical higher educational institutions, laboratory and practical exercises play an important role. However, they often do not give the expected results for the following reasons:

- *Existing laboratory rooms lack of equipment;*
- *many laboratory devices do not meet modern requirements and are outdated;*
- *inefficient use of time by students due to the fact that some laboratory tasks take too much time.*

These problems can be solved through the use of SMART-technologies, electronic information and educational resources, multimedia systems and modeling programs (simulators)[3].

Literature review:

The transfer of learning to the digital educational environment (DSP) is one of the key trends in modern education. Such a transfer creates both new opportunities and serious problems for educators. On the one hand, the transition to the “digit” allows us to significantly expand the range of educational programs, make them more accessible, and improve their quality. On the other hand, the effective use of various resources of the digital educational environment is hindered by the fact that many practices and concepts in this area are in the process of formation. The resulting disagreement of meanings that are embedded in key concepts for the field (“digital educational environment”, “digital educational resource”, “online education”, “blended learning”) leads to the absence of a shared vision of the key parameters of the DSP itself and the means design and implementation of educational activities in it[7].

Since we are using cloud and IoT we can access it anywhere and anytime which will provide us the better proficiency and flexibility. SMART-training will increase the availability of teacher education “always, everywhere and at any time”, will provide an opportunity to independently develop the path of professional growth, equalize the level of education of teachers in urban and rural schools, and open the way to the international educational space. The main goal of SMART-training is to create an environment that provides a high level of competitive education by

developing students' knowledge and skills of the modern society of the 21st century: cooperation, communication, social responsibility, the ability to think critically, quickly and efficiently solve problems. Smart education is a concept for describing a new learning process in the information age[6].

In his research work “Smart Education: New Processes and New Opportunities” A.G. Pollack offers SMART for students a continuing education system (school, university, corporate education) [8]:

- flexible educational programs, portfolio;
- more information about student activities;
- collaborative learning technologies - knowledge creation;
- learning access independent device;
- transfer of many functions of human activity to computers;
- individualization of education to a new level.

Therefore, it becomes obvious that the teacher’s task is to intensify the use of electronic resources, to ensure their reasonable and justified use, which in turn requires constant improvement of his qualifications. The main disadvantage is the lack of direct communication between the teacher and the student.

The authors of one of the first SMART textbooks in Russia, L. A. Danchenok and P. Yu. Nevostruev, highlight such basic principles of SMART learning as[5]:

- learning mobility;
- two-way integration with social media;
- self-completeness and self-actualization;
- online consultation with practitioners;
- content co-creation chain: student - creative course co-author;
- synchronous study of material and the implementation of skills in solving real business problems in a social environment.

The increasing role of self-education in professional development involves changing the nature of the activities of the future pedagogical worker, when he becomes an active discoverer of knowledge, the creator of his own experience, responsible for his activity and its results. The purpose of the article is methodological recommendations on the use of SMART-technologies and the IoT-Internet of Things in a higher educational institution teaching “Network Technologies”, the basic principles of their functioning and basic characteristics are formulated.

Research methodology:

As research methods, the author used interpretation, comparative analysis and generalization of the scientific literature on the problem; an example of tools of SMART-technologies and the IoT-Internet of Things analyzes the relevance and

validity of their use from a didactic point of view, focuses on the need to constantly improve the learning process with their help; methodological recommendations, recommendations on the study, analysis of the state of creation of electronic information educational resources in foreign countries and republics and their use in higher education institutions; with the help of SMART-technologies an intelligent virtual learning environment was formed; development and implementation of electronic information and educational resources in the field of network technologies; Integration development of lessons on network technologies was developed to solve problems, choose alternatives, promote ideas that lead students to independent, creative work; methodological development of the content of educational materials, laboratory and practical tasks for the independent development of students; improving the interaction between students, the development and effective use of training programs developed by the Moodle LMS for collective and individual work on information in the learning environment; the methodological foundations of teaching network technologies of natural sciences using blended learning technologies have been tested.

The technology acceptance model:

Improving the effectiveness of teaching the discipline "Networking Technologies" in higher education institutions based on SMART technology and intellectually adaptive learning systems that determine the present and future distance learning based on web technologies, the importance of e-learning resources in intelligent virtual educational environments, technologies for creating electronic textbooks and their use in pedagogical activity is scientifically substantiated. In recent decades, more attention has been paid to the study of adaptive learning systems. This is an interdisciplinary field that unites various areas of computer science (software development, networking, modeling of knowledge and interactions), humanities (psychology, didactics, communication sciences and ergonomics)[9].

An analysis of the literature showed that modern continuous pedagogical education should be based on the principle of humanism, the development of subjectivity, self-expression [4].

The integrated educational environment created for the subject "Network technologies" is aimed at organizing the educational process for in-depth study by students of the subject, independently, individually and jointly. This environment is a collaborative system of e-learning materials and SMART technologies that integrates media resources, web technologies, software for simulations, interactive online monitoring and analysis tools and Moodle LMS (Education Management System) for the subject of "Networking Technologies". The SMART learning

environment consists of smart devices, simulation software, Moodle LMS, web technologies, SMART Notebook software, SMART Bridgit software, media resources[3].

Media resources - are a set of didactic tools that provide additional video and audio information in training, visually enriching the content of the topic.

Web technologies - electronic online information on the topic "Network technologies" - an educational resource, a tool that helps in the classroom and the acquisition of independent knowledge.

Cisco Packet Tracer - is a graphical simulator that is used to learn how to create computer networks, create graphical stands, learn how to organize them, and test them with virtual network devices, virtual servers, and virtual machines.

Electronic course - created in the Moodle LMS system, includes interactive training materials for lectures and practical exercises, i.e. page, presentation, survey, chat, forum, assignments, wiki, virtual advice database, audio and video tutorials, and cover tests. Students work on information in this visual learning environment collectively and individually, leveraging interactive learning pages and virtual cues developed with the Moodle system. The instructor controls the performance of tasks by students. This system provides interactive communication between participants in the educational process.

This intelligent virtual learning system is characterized by its structure, a variety of teaching materials, interactive communication and the ability of students to choose their own educational paths, the presence of control and handouts, as well as the provision of methodological support to teachers and their content. It includes various interactive tasks for the study of theoretical material on each topic contained in the electronic textbook system, the formation of skills based on knowledge gained, as well as the application of knowledge and skills. Learning using an intelligent virtual learning system is learning that takes into account the characteristics, abilities, motivation, intellectuals and abilities of the learner and is effectively used in the development of modern pedagogical and information technologies. An intelligent virtual training system consists of Smart devices, Smart Classroom - a smart class, Smart campus - a smart collaboration network, Smart Lab - an intelligent laboratory room and tools, Smart Cloud - an intelligent Internet service system, etc. Here are some of the features of teaching the discipline "Network Technologies" in the audience, which are controlled by the SMART system - Auditorium, which is an intelligent virtual learning environment.

This method addresses the following issues:

– *Modeling the classroom with elements of SMART-technology and IoT - Internet of Things;*

- Combining science with teaching methods;
 - Development of a project for the implementation of the discipline "Network Technologies" training using electronic information and educational resources.
 - Set the conditions and limitations of the effective application of this method.
- Consider the model of the educational process of the discipline "Networking Technologies" which is organized on the basis of Smart - technology. (Figure 1.)

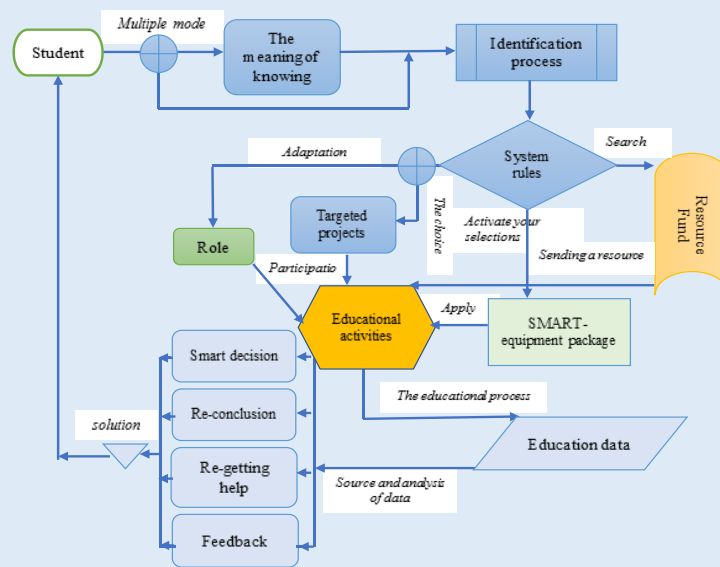


Figure 1. A model of the educational process that is organized on the basis of Smart - technology (block-diagram)

In this case, the student uses the Smart – «Multiple mode» method of accessing the education system. In the «Multiple mode» way, a student can go through the process of learning, that is, understanding the content of the knowledge or going directly into the process of identification. Identification - the user enters a user account (login). All the necessary information about the user through his / her login on the system: his / her identity; access level in the system; system history and more. In addition, each student will be identified by an electronic concert. Electronic Concert is an Internet-based service that provides instant information in various areas, answers to queries, navigation and more. This system introduces students to the novelty of the system, the list of literature recommended by professors.

The next step is to get acquainted with the rules of Smart education system. "System Rules" is a conditional step that offers three areas: Customization, Search, Activation of Options.

In the area of "adaptation," the student role or the target projects are selected, and the transition to the stage of participation in educational activities is key. Flexibility involves adapting e-learning tools to individual learning opportunities. It means adapting the learning process to the cognitive, skills, and psychological characteristics of the learners. There are three levels of adaptation in e-learning tools. The first level gives students the opportunity to choose their individual pace of study material. The second level involves the diagnosis of a student's condition. Based on the results, the content and methodology of teaching will be offered. The third level is based on an open-ended approach that does not imply classification of qualified users, and authors of e-learning tools seek to develop a more accessible option for a large number of users. The role model of a smart-technology-based learning process is a system that defines a student's role, place or role in the learning process. This system classifies users into guest and registered user categories. Depending on the user category, it may allow or prohibit certain actions in the information field. "Purposeful Projects" is the stage of selecting methods, techniques and technologies of education. Project activities are a gradual, coherent and complex student education system that has the knowledge and skills in the planning and implementation of projects.

Project Goals and Objectives:

- *Control of knowledge and skills on the topics covered;*
- *the formation of an information image of the world in the mind of the student;*
- *ability to work with a computer;*
- *development of information search and processing skills;*
- *work on new technologies;*
- *Development of independent work;*
- *students' ability to listen and respect each other's ideas;*
- *ability to trust each participant of the project;*
- *developing research skills.*

Project work promotes the creative activity of students, the ability to carry out research and analyze the work done. In modern education, much emphasis is placed on teaching personal orientation, student identity, the use of student experience, and research methods. A project is usually a collective activity. The collective discussion of the questionnaire, job assignments, the choice of research methods, and the

presentation of the project will be done. At the same time, the individual role of each project participant in the overall task is determined.

During the project, students will develop the following skills:

- communication - ability to communicate;
- The problem is search - the ability to solve life issues;
- ability to analyze excellent activity.

Rules for project success:

1. There are no leaders on the team and all students are equal
2. There is no competition in the team
3. All team members should communicate with each other and work together as project partners
4. Each participant should be active and contribute to the common cause
5. All team members are responsible for the end result of the project.

This method is a form of education that requires the use of research and research methods that allow for a deeper, deeper study of the topic or section of the student's learning.

It enters the Resource Fund in the direction of "Search" and sends the found resource to educational activities. It includes additional science-related resources, presentations, audio-video information and literature. The "Technology Activation" model of the smart-technology-based learning process model addresses the "Smart Equipment Kit" and applies them to educational activities. Smart equipment sets, that is technical maintenance, are the following.

CONCLUSION:

In conclusion, one of the important directions of reforming the education system the in conditions COVUD-19 is the systematic integration and management of the educational process with information and telecommunication technologies. Among the priorities in the reform process are the organization of the individual learning process and the radical restoration of its content, the pedagogical activity of the teacher in a computerized environment and the organization of the student's learning process.

In higher education, the use of a simulator program in the organization and evaluation of individual teaching of the subject "Network Technologies" on the basis of SMART technologies increases the effectiveness of training.

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