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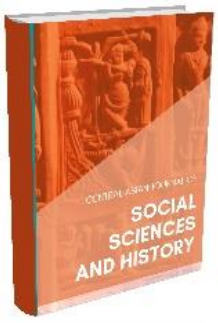

Model of Development of Students' Competence in Network Technologies

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Abstract:
This article talks about the model of developing students' competence in network technologies in pedagogical higher education institutions.

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Today, due to the improvement of digital technologies and the expansion of global networking opportunities, the problem of improving the system of training specialists in this field is emerging.

One of the solutions to these problems requires the development of competence in digital technologies, in particular, network technologies, in improving the quality of professional training of future information technology specialists and future informatics and information technology teachers. Because the technical and software tools related to network technologies are rapidly entering and improving, most of the educational systems created in the future depend on network technologies and telecommunication tools, and the issue of effective organization of the educational process through their targeted use is a task for us.

Therefore, it is necessary to improve the new approaches to the development of the competence of future informatics and information technology teachers studying in higher educational institutions in relation to network technologies, in particular, the forms, methods and means of using virtual educational technologies.

Therefore, within the framework of the study, a model of developing students' competence in network technologies in higher education institutions was developed (Fig. 1).

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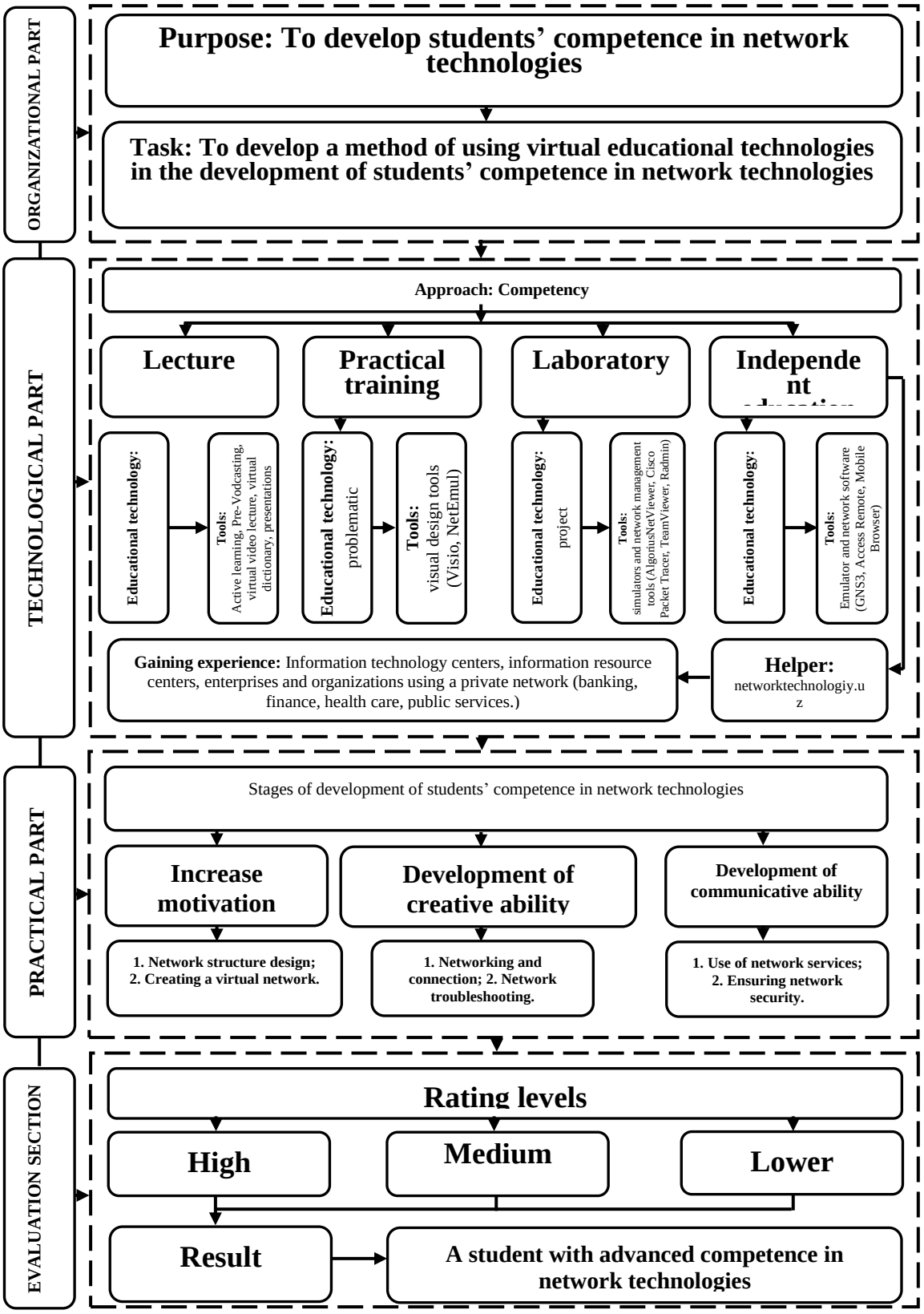

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Figure 1. A model for developing students' competence in network technologies

The proposed model consists of organizational, technological, practical and evaluation parts, and is aimed at developing the competence of students studying in higher education institutions in relation to network technologies. In it, it is proposed to organize the educational activities of students in the auditorium and outside the auditorium on the basis of virtual educational technologies, practical programs intended for designing, and an information-educational environment.

As a result of using this model, it is intended to achieve the following:

- formation of students' skills and competencies related to the construction of computer networks with the help of practical programs intended for design;
- to visualize the operation of computer networks with the help of practical programs designed for visualization, to develop competence in network technologies by seeing a virtual image of the processes taking place in it;
- use of electronic educational resources placed in the information-educational environment as methodical support for acquiring theoretical knowledge of network technologies, developing practical skills, performing laboratory exercises and independent education.

Also, in the technological part of this model, it is aimed to increase the effectiveness of teaching in the lecture, practical, laboratory sessions on network technologies and organize independent educational activities based on the competence approach. It suggested the use of tools such as Active learning methods, virtual video lecture, virtual explanatory dictionary and presentation on the basis of educational technology that develops lecture classes.

If we dwell on the possibility of active learning methods, their use is important in the development of students' qualities such as activeness in classes, independent decision-making, and expression of one's opinion.

In this regard, i.e. research on the theory and practice of introducing active learning methods into the educational process, G.A.Pollak, A.G.Paley, E.Yu.Grudzinskaya, V.V.Mariko, S.Hanson, S.Moser, R.Schevens, A.Griffin, C.Jocoy, Y.Liu, M.Bradford, S.Freeman, S.L.Eddy, M.McDonough, M.K.Smith, N.Okoroafor, H.Jordt, M.P.Wenderoth were studied by such scientists. From their work, they proved theoretically and practically that it is possible to achieve effective results by using active learning methods in the teaching of computer science subjects.

In particular, G.A.Pollak, A.G.Paleylar suggest the use of Active learning methods in conducting lectures of the computer science course and developing students' competence in information and communication technologies. According to them, Active learning involves placing the initiative and activity of the teacher on the students, using their wide interaction not only with the teacher, but also with each other. In such conditions, the task of the teacher is to organize the learning process in such a way that contributes to the initiative of students. This can be done by giving appropriate tasks, formulating questions for discussion in groups, encouraging students to use additional sources of information [14]. E.Yu.Grudzinskaya, V.V.Marikolar emphasize the need to use Active learning methods to increase the effectiveness of teaching "Theoretical Foundations of Informatics". According to them, Active learning is a method of increasing students' activity in learning, which is mainly based on dialogue, which includes free exchange of ideas on ways to solve a specific problem [6].

At the same time, in the model, practical training on network technologies is aimed at conducting

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using Visio, NetEmul applications for visual design based on problem-based learning technology.

Conducting practical training using problem-based educational technology is effective in forming and developing students' knowledge, skills, and abilities related to solving problems encountered in network technologies. Therefore, the use of problem-based educational technology in the development of students' competence in network technologies was determined as the research goal.

D.M.Makhmudova, Z.Q.Ismoilova, Sh.A.Raupova, O.V.Petrushin, L.I.Tsvetkova, U.A.Nurullaev, L.P.Uzokova, L.G.Volkova and other scientists conducted scientific research.

In particular, D.M.Makhmudova stated that the use of problem-based educational technologies in the process of teaching informatics is of particular importance in solving the critical aspects of the student's potential and preparation for potential activities [11]. According to Z.Q.Ismoilova, Sh.A.Raupova, problem-based learning technology is used in the course of teaching various academic subjects, students can find solutions to problematic issues or situations arising from the topic of the subject, introduce some of their methods and choose the appropriate methods correctly. is to teach to correctly identify the reasons for the exit and the actions to solve it [7]. In problem-based learning technologies, it is important to create a problem situation, to be able to ask questions correctly, and to search for their solution together with a group and individually [13]. According to L.I.Tsvetkova, "Problem-based education is a system of teaching methods and tools, the basis of which is to model a real creative process by creating a problem situation and managing the search for a solution to the problem" [17].

L.P.Uzokova stated that the use of problem-based educational technologies in the teaching of special subjects equips students with the methods of knowing the surrounding existence, develops skills and abilities, the ability to generalize and conclude the main laws, and forms research skills in them [15]. According to L.G.Volkova, problem-based teaching and the introduction of visual technologies in education using pedagogical software tools and global network services in the context of digitization will help the student to increase his activity during practical training, develop qualities such as in-depth analysis of existing situations and factors, and teamwork. allows [5].

According to the analysis of the works of the above-mentioned scientists, it is possible to develop students' competence in network technologies through the effective use of software tools designed for problem-based learning and design based on visual technologies.

In this regard, T.V.Malyugina, E.V.Kvaltyreva, A.V.Minkin, A.Vasilyava have conducted research, and they say that effective results can be achieved by using project technology and software tools for visual design in the educational system.

In particular, according to T.V.Malyugina, pedagogical software tools such as Microsoft Visio, JNetMap and lucidchart.com (mobile application lucidchart.app) intended for visual design, design computer networks, the main aspects of their operation at the logical level, as well as the location of users' workplaces and peripheral equipment of the network. allows visual reflection [10]. E.V.Kvaltyreva and A.V.Minkin proposed to use Microsoft Visio program as a tool for modeling electric circuits and circuits in teaching physics. According to them, for students with Microsoft Office skills, working with the Visio program is quickly mastered [9].

A.Vasilieva stated that the visualization of educational information allows solving a number of pedagogical problems, such as ensuring the intensity of teaching, activating educational and cognitive

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activities, forming and developing critical and visual thinking, visual perception, transferring knowledge and illuminating in a figurative form [1].

Software tools designed for visual design visually represent problems related to the operation of a computer network in a graphical form. Also, it is possible to simplify the work of network analysis in information technology departments, to plan based on possibilities, to collect important data by viewing the communication structures of a node (node - a place where computer networks or their individual elements are connected) in visual conditions, and to conduct laboratory experiments.

At the same time, in this model, it is recommended to use training tools such as network technology laboratory exercises, project education technology and simulators, and network management programs (AlgoriusNetViewer, Cisco Packet Tracer, TeamViewer, Radmin).

Within the help of this software in laboratory classes, Simulants in the process of use and education in Laboratory work in the process of use of simuthulants, Sh.S.Shoyimova, Q.N.Khaitov, A.A.Rakhmatullaev, A.D.Kariev, T.P.Fisenko, A.X.Panesh, T.Sorova has been researching.

In particular, according to T.Sorova, project education technology is one of the methods of organizing an effective educational process based on personal direction aimed at forming qualities such as independence, initiative, and creativity in students [19].

According to Sh.S.Shoyimova, Q.N.Khaitov, A.A.Rakhmatullaev, project teaching technology in the educational system activates students' cognitive activity, students' creativity, intuition, speech, organization, research, leadership skills, independent and reflexive thinking helps to form and develop professional competencies [18].

According to them, the projects can be divided into such categories as conducting scientific research aimed at the development of new technologies, carrying out creative work, collecting and analyzing information, and being practical. In the process of working on the project, students develop qualities such as teamwork, a sense of responsibility, the ability to analyze their own work, and the ability to compromise in order to solve a common problem [8].

In the work of the above researchers, the project includes a number of conditional stages that determine the sequence of technology implementation:

- search engine (search and analysis of problems, project topics);
- analysis (gathering and analyzing information);
- practical activity (project quality control);
- presentation (project presentation);
- control (analysis of results, quality assessment).

It is desirable to integrate theoretical knowledge in the conditions of closeness to professional activity when performing tasks given in laboratory training [12]. Because the organization of laboratory training on network technologies causes many problems:

- that there is no possibility to organize laboratory exercises in each group and pair directly with the help of computer class and network equipment;
- difficulties in reconfiguring existing computers and network equipment during each laboratory session;

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- the wrong behavior during the laboratory exercise will cause the entire network to fail.

There are two options for overcoming these problems and organizing laboratory activities effectively. The first option is an auditorium equipped with computers and network equipment, in which laboratory exercises can be effectively conducted using real equipment. However, this approach also has significant drawbacks, which are the high cost, lack of computer and network equipment, and the disruption of network configuration. The second option for conducting laboratory training is the use of special software that allows simulation of computer networks.

The approach of using simulators allows to experiment without building a real network [12]. With the help of network simulators, laboratory exercises can be carried out without changing the configuration of the existing network in a regular computer classroom. Also, network simulators have a number of functionalities and perform tasks such as building simple and complex network schemes, checking topologies. In this case, the students' acquired theoretical knowledge makes it possible to try it out in practical classes and conduct experiments in laboratory classes.

With the help of design applications proposed in this model, it is possible to increase the motivation of students in the field by teaching them how to design a network structure and create a virtual network. Also, as a result of teaching methods of creating, connecting, and solving problems in computer networks in the auditorium or information technology centers, students' creative abilities are developed. At the same time, as a result of the purposeful use of the services of network technologies, as a result of mastering the methods of ensuring its security, students develop cognitive ability.

Thus, by using the proposed model, the development of students' competence in network technologies is achieved.

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