INFORMATION AND PROFESSIONAL COMPETENCE OF FUTURE ENGINEERS

Abdurakhmanov Zokhidjon
Jizzakh branch of the National University of Uzbekistan

Abstract. This article provides a theoretical analysis of the current state of the problem of preparing engineers for professional activities in Uzbekistan. The features of the training of engineering personnel for professional activities using information technologies and the development of information and professional competencies in the context of digital education are presented. The results of creating a model for the formation of information and professional competencies by means of virtual laboratory complexes and electronic educational technologies are presented.

Key words: competence, information and professional competences, model, virtual laboratory complexes, virtual learning systems.

ВИРТУАЛЬНАЯ ОБРАЗОВАТЕЛЬНАЯ СИСТЕМА РАЗВИТИЯ ИНФОРМАЦИОННО-ПРОФЕССИОНАЛЬНЫХ КОМПЕТЕНЦИЙ БУДУЩИХ ИНЖЕНЕРОВ

Абдурахманов Зохиджон Бахтиёр угли
Джизакский филиал Национального университета Узбекистана

Аннотация. В данной статье проводится теоретический анализ современного состояния проблемы подготовки инженеров к профессиональной деятельности в Узбекистане. Представлены особенности подготовки инженерных кадров к профессиональной деятельности с использованием информационных технологий и развития информационно-профессиональных компетенций в условиях цифрового образования. Представлены результаты создания модели формирования информационно-профессиональных компетенций средствами виртуальных лабораторных комплексов и электронных образовательных технологий.

Ключевые слова: компетентность, информационно-профессиональные компетенции, модель, виртуальные лабораторные комплексы, виртуальные обучающие системы.

BO'LAJAK MUHANDISLARNING AXBOROT VA KASBIY KOMPETENTLIGINI RIVOJLANTIRISH UCHUN VIRTUAL TA'LIM TIZIMI

Abduraxmanov Zoxidjon Baxtiyor o'g'li
Mirzo Ulug'bek nomidagi O'zbekiston Milliy universitetining Jizzax filiali

Annotatsiya. Ushbu maqolada O'zbekistonda muhandislarni kasbiy faoliyatga tayyorlash muammosining hozirgi holati nazariy tahlil qilingan. Axborot texnologiyalaridan foydalangan holda kasbiy faoliyat uchun muhandislik kadrlarini tayyorlash va raqamli ta'lim sharoitida axborot va kasbiy kompetensiyalarni rivojlantirish xususiyatlari keltirilgan. Virtual laboratoriya komplekslari va elektron ta'lim texnologiyalari yordamida axborot va kasbiy kompetensiyalarni shakllantirish modelini yaratish natijalari keltirilgan.

Kalit so'zlar: axborot va kasbiy kompetensiyalar, virtual laboratoriya komplekslari, virtual o'qitish tizimlari, kompetensiya, model.

1. Introduction. The emergence of new forms, technologies and resources, of course, has an impact on the learning process in universities. Already today there are a large number of practices confirming the use of Internet resources in the educational process, but their mass use is associated with a number of difficulties.

An analysis of the results of the research shows that in the modern labor market there is a demanded social order for specialists with the knowledge and skills to work with spatial data and large amounts of information in the information and analytical supply of management. The fulfillment of this order, first of all, will require the setting of a number of pedagogical tasks within the framework of the advanced formation and development of professional competence in a situation of social diffusion of the latest information technologies.

Our pedagogical research shows that the current practice of training future engineers

at the university of Uzbekistan demonstrates insufficient attention to a practice-oriented approach and a tendency towards the universalization of information professional competence. Nevertheless, modern students show the abilities formed by the external information environment and the school to form and develop information professional competence in the direction of teaching in-depth informatization of specific types of professional activities.

In connection with the foregoing, we put forward an assumption about the need to develop associative thinking among future engineers and the advisability of using virtual learning systems to solve this educational problem.

2. Research Methodology. Our study allowed us to confirm the heuristic and expediency of the competence-based approach that we have identified as a theoretical and methodological basis in the formation and development of the information professional competence of future engineers. Diagnostics of information professional competence of students, analysis of modern principles of informatization show the possibilities of influence of the future engineer on the effectiveness of the innovative way of development of the industry in the context of general informatization. In addition, this social target orientation requires the integration of professionally oriented competencies related to the skills and abilities of using virtual learning systems in management, a set of professional and general cultural competencies related to the tasks of promoting virtual learning systems as innovations.

Today, the task is to develop and form the skills and knowledge of the assimilation of information professional innovations, to effectively demonstrate its importance and value for solving specific professional problems. Therefore, the information professional competence of future engineers includes the ability to convince and need to use new information tools, to form information, economic, emotional, managerial, technological conditions for the introduction of virtual learning systems and other innovations.

Analysis of the requirements for future professional activity is the basis for modeling the structure of education. Revealing the structure and essence of the term «information professional competence» helped us to create a model of its formation among future engineers by means of virtual learning systems.

Under the formation and development of professional information professional competence of future engineers, we understand the controlled, purposeful promotion of future specialists in the study of theoretical concepts and methods of functioning of the relevant technologies and processes.

Psychological and pedagogical support for the development of this competence includes a set of appropriate means, forms, content, methods, organizational and pedagogical conditions that contribute to the formation and development of information professional competence of future engineers.

An analysis of the psychological and pedagogical problems of development and the social demand for the information professional competence of specialists has demonstrated the shortcomings of the models used today in the practice of professionally oriented training in the universities of Uzbekistan. The model developed by us for the formation of information professional competence of students consists in coordinating all components of the pedagogical process for the implementation of didactic synthesis and interdisciplinary connections between the disciplines of professional and information training, as a condition for the development and formation of information professional competence of future engineers.

The creation of a model for the development and formation of information professional competence was implemented according to the following logic: identifying the purpose of designing the model, its connection with the tasks and purpose of the activity under study, substantiating the modules of the model (meaningful, motivational, technological), determining the principles and approaches on the basis of which this model works (experimental testing of the model, determination of the main result).

The proposed model for the formation of information professional competencies by means of virtual laboratory complexes and electronic educational technologies belongs to the category of «concept». The concept of «concept» implies a certain relationship between its components and the pedagogical system. The concept of «concept» includes the main modules of the model: motivational, content, technological and control.

As a result of the study of the methodological and theoretical foundations for the formation of information and communication competencies of students in virtual learning systems, a model was built and described, consisting of modules: meaningful, technological,
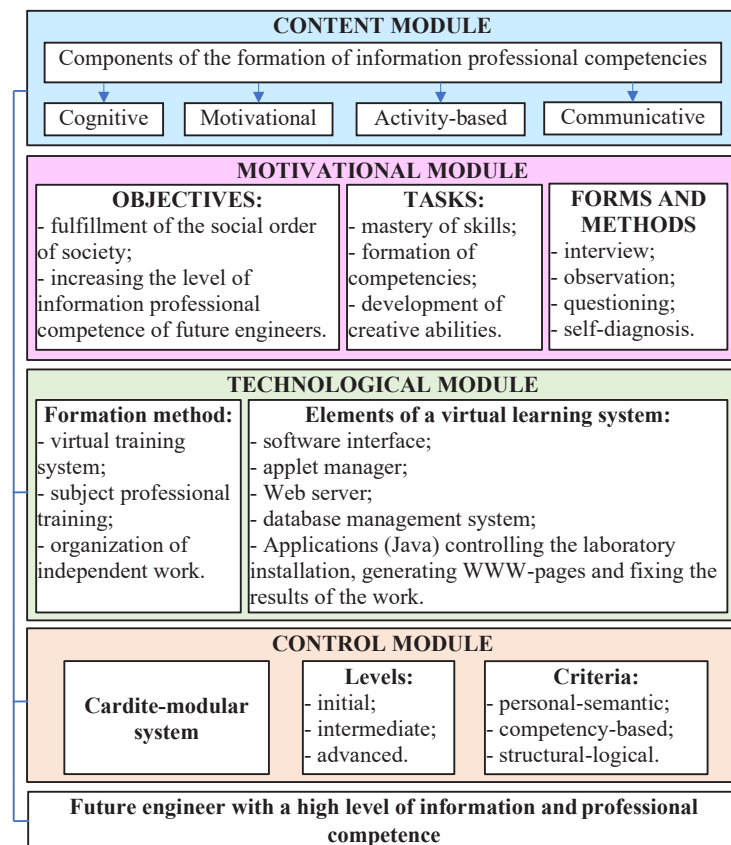
motivational and control.

The content module helps to provide future engineers with the opportunity to master skills and knowledge while solving educational problems.

The technological module consists of teaching aids used in the virtual laboratory complex.

The motivational module has an impact on the formation and development of information professional competencies in achieving tasks and goals in the motivational sphere, which positively affects the educational process.

The control module helps to determine the effectiveness of the process of formation and development of information and communication competencies of future engineers in the course of using virtual laboratory complexes. The control module contains a credit-module system that has segments of control and evaluation at various stages of learning.

The purpose of the content block is the formation and development of information professional competencies of future engineers: motivational, cognitive, activity, communication components, which determine the student's readiness to acquire knowledge in special disciplines, the ability to independently find, process, analyze and transform, transmit and store information through communication and information technologies, the desire for creative self-realization and self-education in the educational process.

CONTENT MODULE

Components of the formation of information professional competencies

| Cognitive | Motivational | Activity-based | Communicative |

MOTIVATIONAL MODULE

OBJECTIVES:	**TASKS:**	**FORMS AND METHODS**
- fulfillment of the social order of society; - increasing the level of information professional competence of future engineers.	- mastery of skills; - formation of competencies; - development of creative abilities.	- interview; - observation; - questioning; - self-diagnosis.

TECHNOLOGICAL MODULE

Formation method:	**Elements of a virtual learning system:**
- virtual training system; - subject professional training; - organization of independent work.	- software interface; - applet manager; - Web server; - database management system; - Applications (Java) controlling the laboratory installation, generating WWW-pages and fixing the results of the work.

CONTROL MODULE

Cardite-modular system	**Levels:**	**Criteria:**
	- initial; - intermediate; - advanced.	- personal-semantic; - competency-based; - structural-logical.

Future engineer with a high level of information and professional competence

Model for the formation of information professional competencies in future engineers

The process of formation and development of information professional competencies of future engineers is carried out at the university with the interaction of the following subjects in the course of educational activities:

1. For a teacher who forms information professional competencies of educational electronic technologies;

2. For students involved in a joint educational process and creative and cognitive activities that contribute to the formation of their information professional

competencies;

3. Virtual learning systems is an environment for the formation of information professional competencies.

Analyzing in detail the model for the formation and development of information professional competencies, the future engineer is offered both traditional and modern approaches and forms to learning in virtual laboratory complexes, which are an innovation in the pedagogical technology of the educational process. The virtual space where information professional competencies can be formed consists of the following components: cognitive, motivational, communication and activity areas.

Structural components of the development and formation of competencies in the field of engineering technologies have been designed:

The cognitive component consists of the value of information and knowledge of the essence of modern society, the latest technologies and their principles, analysis, information processing and working with a computer, knowledge of basic software, computer technology, software products, knowledge of information protection methods, the distinctive features of the information society.

The motivational component involves identifying the motives of future engineers to enhance learning activities in a virtual laboratory complex and e-learning, includes the aspect of the formation and development of competencies, the need for self-development, self-realization and self-improvement in the educational process.

The communication component contains the aspect of the formation and development of competencies in the training of future engineers, involves the use of communication tools in electronic systems, Internet resources for feedback in the educational process.

The activity component consists in the ability to apply information professional competence in future professional activities; development of skills in working with software and tools for professional and general purposes, to comply with information security requirements, the ability to work with information and data in global computer networks.

The motivational module of the model considers tasks, goals, methods and forms, organizational methods for the formation and development of information professional competencies by means of virtual laboratory complexes.

In the process of formation and development of information professional competencies of future engineers, the following tasks are solved by means of virtual laboratory complexes and educational technologies:

1) mastery of skills;
2) formation of competencies;
3) development of creative abilities.

Accordingly, for the implementation of these tasks, the use of virtual laboratory complexes, methodological support for electronic training programs will be effective: information and reference materials, methods and forms of organizing the educational process: survey, observation, questioning and self-diagnosis.

The purpose of the motivational module of the model is to highlight the initial foundations, determine the direction for the effectiveness of the process of forming information professional competencies. In addition, it includes goals that are determined by the social order of the modern information society, the requirements of state international and educational standards, the curriculum of the specialty, the pedagogical process of the university, and the program of a specific educational process.

The social order of modern society implies the achievement by future engineers of a certain level of information professional competencies, which makes it possible to use informatization tools to solve professional problems.

Education and training of such a specialist takes place through the development

of the requirements of the state educational standard for vocational education of universities and requirements for the level and minimum content of graduate training.

The task of the university, in turn, is to organize an effective pedagogical process in accordance with the standard.

The content of educational activities is determined by curricula, curricula in subjects that determine the direction of preparing students for a specific competence.

The technological module is a backbone element in the presented model. The module contains a methodological framework with personality-oriented and competence-oriented approaches.

The methodological basis is as follows:

1) application and development of methods, content and forms;

2) competence-oriented approach;

3) application of virtual laboratory complexes;

4) independent work;

5) control of the quality of training.

The technological module of the model for the formation of information professional competencies presents the following elements of virtual laboratory complexes:

- software interface for laboratory work;

- applet manager;

- Web server;

- database management system;

- an application (Java) that controls the laboratory installation;

- servlet (Java) that generates WWW-pages;

- applications (Java), fixing the results of the user's work with the system.

It should be noted that the components of virtual laboratory complexes consist of both various traditional educational tools (intelligent lectures, maps, seminars) and innovative ones (electronic learning systems, participation in various electronic platforms, the use of electronic testing, etc.).

In the control module, we single out the levels of competence formation: advanced, intermediate and intial levels.

The control module also includes a credit-module system consisting of control points at various stages of education.

To identify the level of formation of information professional competencies of a future engineer of a particular component, we have defined the following criteria: competence-based, personal-semantic, structural-logical.

The process of each module consists of the following parts:

1) creation of virtual electronic cards;

2) independent work (solving tasks for performing laboratory work);

3) conducting training sessions (practical work at a computer);

4) control of the formation and development of information professional competencies (testing).

3. Results

The result shows the formation of information professional competencies of future engineers, which is determined by three levels (advanced, intermediate, intial).

The model proposed by us provides for the fulfillment of the following organizational and pedagogical conditions:

1) integration of elements of e-learning systems and technologies and traditional teaching methods;

2) creation of a virtual learning environment, taking into account the competence-based approach in education;

3) increasing the motivation of intellectual and cognitive activity of students, taking into account the creation of an information and technological environment.

In connection with the foregoing, by developing the skills of information professional competencies, the future engineer acquires competencies that correspond to his professional activities. A set of standard competencies: general cultural competencies, key competencies, information professional competencies, professional competencies.

Thus, the developed model makes it possible to identify the content of competence, form competencies, show the logic of the formation of information professional competencies, using the means of a virtual training system in organizational and pedagogical conditions.

The main goal of creating and implementing the developed model is the formation of professional information professional competence of future engineers.

Basic information professional competence - the readiness and ability of a future engineer to perform simple professional tasks using the skills of an advanced user (search for training materials, the ability to work with virtual training systems, create multimedia elements). Possession of basic information professional competence allows you to form key information professional competence, in other words, the ability of a specialist to perform standard professional tasks using modern information technologies. The ability of a future engineer to perform non-standard and complex professional tasks based on information professional determines special information professional competence. Any level differs in the depth and specificity of mastering one or another computer tool, in addition, it is impossible to possess special competencies without basic knowledge of the use of information professional in professional activities.

The predictable result is the mastery of the relevant theoretical concepts, increasing the information professional competence of future engineers, which is the basis of the control block of our model. It defines the features of the process of formation and development of information professional competence, the methods, forms and means of training used, and contains indicators, criteria and levels of formation of information professional competence.

The use of the methodology for the formation and development of information professional competence is related to the development and use of a virtual laboratory complex of a virtual training system.

It should be noted that the methodology for the formation and development of information professional competence is based on establishing links between the components of the content of disciplines of subject and information training, the implementation of which is carried out at the level of didactic synthesis and interdisciplinary connections.

Thus, on the basis of the above proposals for the organization of the virtual educational system of the university, it is possible to determine the basic principles of its construction:

1) the continuity and complexity of teaching specific professionally-oriented disciplines within and with the help of subjects of the information cycle;

2) problem-modular approach to solving professional problems;

3) an individually-oriented approach to the choice of a subject area, which is implemented with the help of calculation and graphic tasks;

4) independence not only in the formation of a practical goal, but also in the choice of ways to achieve the goal;

5) active study of professionally oriented components in the course of introductory, industrial and practical training.

References

1. Usmanov S. A. Features Implementing European Credit and Modular System at Higher Education Institutions of Uzbekistan //Eastern European Scientific Journal. – 2019. – №. 1.

2. Salahdin U., Kamoliddin Z. Conceptual aspects of the creation of competitive education system in Uzbekistan //European science review. – 2016. – №. 11-12. – C. 117-119.

3. Усманов С., Абдурахманов З. Рақамли таълим муҳитини яратиш концепцияси //Zamonaviy innovatsion tadqiqotlarning dolzarb muammolari va rivojlanish tendensiyalari: yechimlar va istiqbollar. – 2022. – Т. 1. – №. 1. – C. 225-228.

4. Усманов С. А. Стратегии развития высшего инженерного образования в Республике Узбекистан //Молодой ученый. – 2016. – №. 7-2. – C. 107-109.

5. Alikulovich U. S., Baxtiyor o'g'li A. Z. BO 'LAJAK MUHANDISLARNI KASBIY TAYYORLASH METODIK TA'MINOTINI TAKOMILLASHTIRISH // International Journal of Contemporary Scientific and Technical Research. – 2022. – C. 168-172.

6. Usmanov S. U., Murotmusaev K. B., Ravshanov O. A. PSYCHOLOGICAL AND PEDAGOGICAL ANALYSIS OF TUTORIAL ACTIVITY IN EDUCATIONAL STRUCTURES //International Journal of Mechanical Engineering. – 2022. – C. 1808-1815.

7. Usmanov S., Amanova D. Snaryadning harakatini modellashtirishda yo 'l qo 'yilishi mumkin bo 'lgan og 'ishlar (cheklanishlar, ehtimolliklar) //Zamonaviy innovatsion tadqiqotlarning dolzarb muammolari va rivojlanish tendensiyalari: yechimlar va istiqbollar. – 2022. – Т. 1. – №. 1. – C. 384-387.

8. Усманов С. А., Соатова Д. А. Кўп мақсадли муҳандислик таълими дастурларини амалга жорий қилиш истиқболлари: хориж тажрибаси // Современное образование (Узбекистан). – 2016. – №. 3. – C. 9-17.

9. Усманов С. А., Халилов А. Х. Модернизация высшего инженерного образования в Узбекистане в контексте глобализации и интеграции //Подготовка профессиональных управленческих кадров: опыт, проблемы, инновационные образовательные технологии. – 2015. – C. 158-163.

10. Усманов С. А., Халилов А. Х. РОЛЬ УЧИТЕЛЯ-ФАСИЛИТАТОРА В СРЕДЕ САМОСТОЯТЕЛЬНОГО ОБУЧЕНИЯ //Подготовка профессиональных управленческих кадров: опыт, проблемы, инновационные образовательные технологии. – 2013. – C. 234-238.

11. Abdunazarov J. et al. SHAHAR SHAROITIDA AVTOMOBILLLARNI PARKOVKALASHDA INNOVATSION LOYIHALASH TIZIMI //Scientific-technical journal. – 2020. – Т. 3. – №. 6. – C. 62-70.