The OSCAR PUBLISHING Services
International Journal of Pedagogics

VOLUME Vol.05 Issue03 2025
PAGE NO. 210-215
DOI 10.37547/ijp/Volume05Issue03-60

Development of future engineers' professional competence through traditional educational methods

Kuchkarbaev Rustam Utkurovich

Doctor of Philosophy in Pedagogical Sciences (PhD), Department of Buildings and Structures, Tashkent University of Architecture and Civil Engineering, Uzbekistan

Received: 29 January 2025; **Accepted:** 28 February 2025; **Published:** 31 March 2025

Abstract: The task of specializations based on the field of education is to deepen students' knowledge and develop skills in the areas of modern design principles, creation of energy-efficient buildings, innovative constructive solutions, construction standards and regulations, the genesis and transformation of historical cities, typological solutions for architectural monuments, harmonizing and decorating [1; 8-b.] architectural forms, utilizing monuments for modern purposes, modern urban planning and landscape architecture, and developing effective solutions for transport network issues. This is achieved by enhancing knowledge and skills through the application of advanced pedagogical technologies.

This issue can be addressed in higher technical education institutions through the implementation of education policy. This policy helps increase the level of training competitive and socially protected specialists, and contributes to the development of their professional capabilities [2; 19-b.]. As a result, we can obtain well-rounded engineers who are capable of performing tasks in an ever-changing modern environment.

Considering that the informatization of society is one of the global issues today, it takes the leading position when compared to other trends in the development of modern society.

The sharp increase in the implementation of new modern traditional educational methods and information technologies today has created a new information environment for humanity, which divides traditional educational tools into several groups.

Keywords: Competence, design, climate factors, model, software tools, automated systems.

Introduction: This issue can be resolved in higher technical education institutions through the implementation of an effective educational policy. As a result, we will be able to train well-rounded engineers who are capable of performing tasks in constantly changing modern conditions.

In today's rapidly evolving world, where the speed of accessing and utilizing information has significantly increased, it is impossible to improve the quality of education and nurture socially active youth without integrating software-based educational tools into the education system [3; p. 9]. In the past, educational programs were delivered using traditional methods—primarily in the form of lectures—and the learning process heavily relied on large volumes of textbooks and manuals. Nowadays, the process of digitizing education has begun. This transformation, in turn, provides modern conveniences for learners and simplifies the process of acquiring knowledge.

The development of the information society requires new approaches to the training of specialists across all educational fields in higher technical institutions, and this remains a pressing issue for professionals. A review of state educational standards for general professional subjects in technical higher education institutions shows that it is impossible to train a competent specialist for the information age using outdated approaches [8; p. 15]. At the threshold of the information age, merely having the ability to perform individual tasks using a personal computer is no longer sufficient for a specialist. In Uzbekistan, the labor market demands a high level of professionalism across all areas of specialist activity. Today, technical higher education institutions require computers capable of

analyzing data and utilizing global and local information flows to support decision-making. This, in turn, necessitates the development of a certain level of information culture.

Literature review

In the current stage of transitioning to a new systematic state, it is essential to focus on the best traditions of the national engineering education system, which has preserved valuable and important approaches to training highly qualified engineering personnel.

According to the Russian researcher A.A. Karavanov [6], the concept of effectiveness in education is reflected in higher education through the criterion of student satisfaction within their chosen professional field. This should be viewed as the student's attitude toward their selected profession or specialization, which, in turn, serves as the ultimate goal of education. In addition to the level of professional orientation as a component of the motivational-targeted foundation, other supplementary criteria include the level of educational motivation and the degree of interest in various academic subjects that reflect the student's future professional activities. Based on the degree to which the content, goals, and objectives of education are embodied, electronic educational resources can be integrated into the learning process.

From a pedagogical perspective, digital learning facilitates the development of human thinking by addressing complex, often poorly understood concepts and scientific problems through extensive computations. In their research, O.I. Voinova and V.A. Pleshakov emphasize that we are already living in an era of cyber-socialization, highlighting the necessity for individuals to adapt and live within the digital age. The authors describe cybersocialism as a set of qualities that enables individuals to organize life in cyberspace—not independently, but as part of networked communities acting as subjects—within the context of performing various social functions [7, p. 120].

METHODOLOGY

The design of buildings must ensure a comfortable living environment. However, properly addressing the design tasks discussed above does not fully guarantee the comfort of the building's internal environment. It is essential to ensure the physical parameters of the indoor environment that create a sense of physical comfort. These include maintaining appropriate temperature and humidity conditions, ensuring optimal air quality parameters, creating suitable lighting and acoustic comfort, as well as providing insulation, solar protection, and soundproofing between rooms. These are factors that are directly perceived by humans.

The climatic factors that influence the design and construction of buildings include the following:

1. External air temperature;
2. Humidity of the external air;
3. Wind, including its direction and speed;
4. Solar radiation;
5. The daily and annual course of natural daylight and sky brightness;
6. Probability of cloudy, clear, and partially clear skies;
7. Rain and snowfall, snow loads, statistical likelihood and volume of snow accumulation;
8. Depth of ground freezing.

Climate analysis makes it possible to determine the appropriate type of building that should be designed for a specific region, taking into account the climatic conditions (Figure 1).

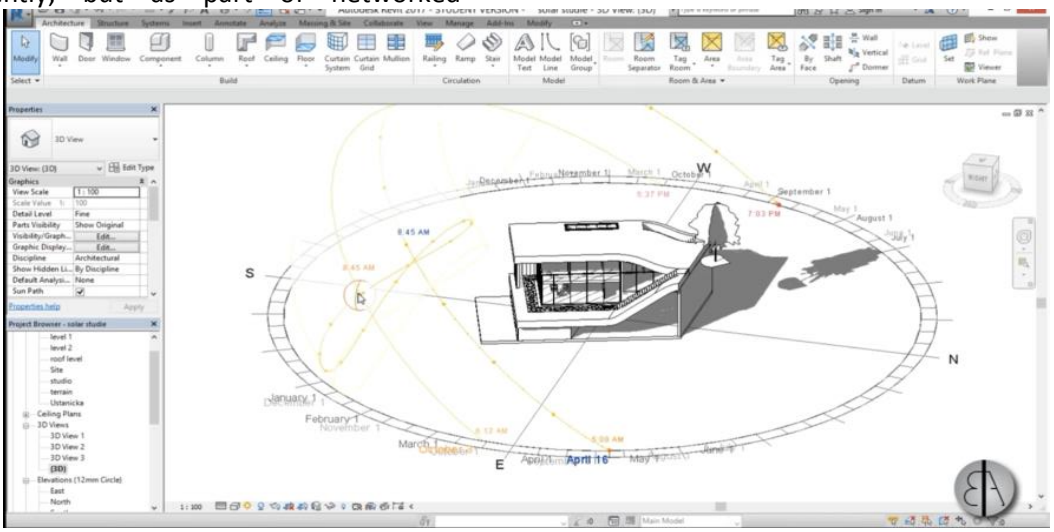

Figure 1. Visualization of the sun path in building design

Construction is considered one of the key sectors of the economy. The volume of construction output is always regarded as an indicator of its stability.

An organization's information technologies are designed to serve the strategic objectives of the business. At the same time, they are widely used to manage the operations of structures and facilities, financial, informational, and material flows, workplaces, and teams of personnel.

In the fields of economics, marketing, and management, the demand for information and information services drives the development, dissemination, and effective use of information technologies (IT). The strategic objectives of information technologies are to ensure business development, enhance management and quality, improve competitiveness, and reduce the cost of business processes.

Information technologies refer to the systematized sequence of operations performed on information using automation tools and methods (Figure 2).

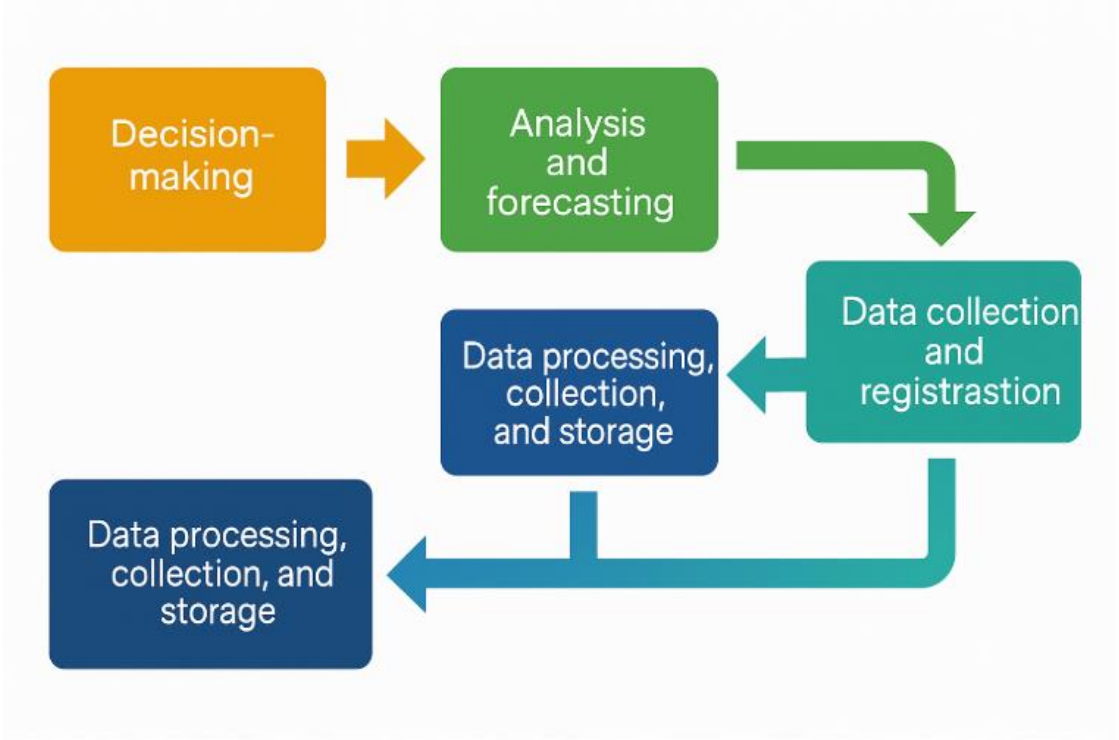

Figure 2. Functions of Basic Automated Information Systems

In Uzbekistan today, the most widely used software for designing buildings and structures is AutoCAD. This software package is mainly suitable for developing only very small and simple projects and is primarily used to automate the routine work of creating project drawings.

CAD – Computer-Aided Design (in Uzbek: KYL – Kompyuter yordamida loyihalash) is a software package designed for the development (or construction) of production facilities, as well as for preparing project and technological documentation [4; p. 62].

The components of multifunctional CAD systems are traditionally integrated into three main parts: CAD, CAM, and CAE.

The CAD (Computer-Aided Design) module is primarily intended for performing graphic tasks.

The CAM (Computer-Aided Manufacturing) module is designed to solve problems related to the technological preparation of production.

The CAE (Computer-Aided Engineering) module is intended for engineering calculations, project analysis, and verification (see Figure 3).

RESULTS

Today, depending on the purpose of the construction, the type of object, and the geodetic, hydrogeological, and climatic conditions, various concepts and technologies are applied. The systems that are widely used nowadays are referred to as Intelligent Systems.

The main component of intelligent buildings is the Building Management System (BMS). It is precisely this system that enables all engineering systems to operate as a unified complex, allowing them to exchange information and be centrally controlled from a single control room.

The Building Management System (BMS) includes a

number of essential engineering systems through which modern buildings are managed. The main ones are:

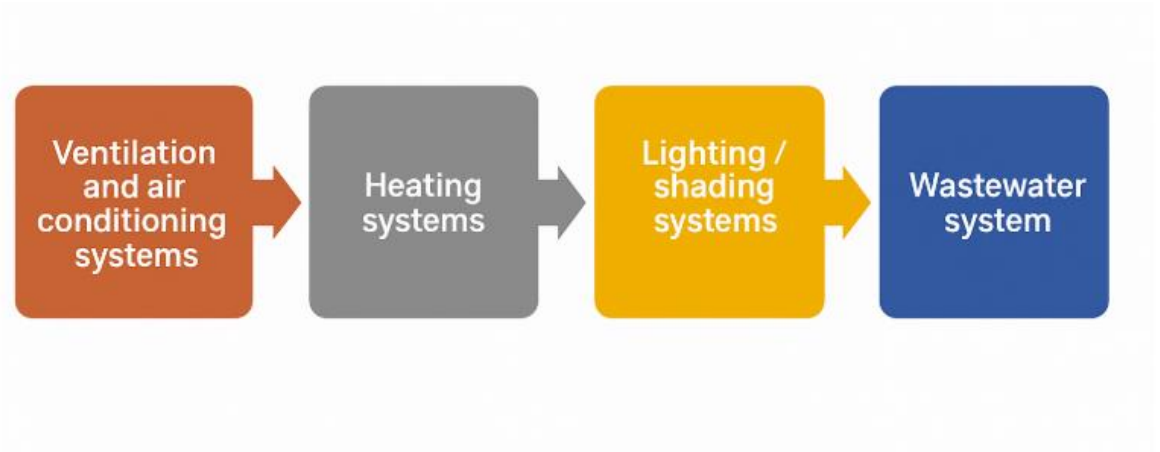

Figure 3. Engineering systems required for building automation systems

To increase economic efficiency, all the above-mentioned systems are integrated into a central control point and are developed based on human needs and the intended purpose of the building.

As part of the ever-increasing demand for comfort and compactness, special attention is given to indoor air exchange (ventilation). The automatic ventilation and air conditioning system allows for monitoring and regulating air humidity, cleanliness, and oxygen levels based on heat intensity and excess humidity. This is achieved through sensor signals and is controlled according to programmed time parameters.

Thus, in addition to providing comfortable living conditions, these systems significantly enhance energy efficiency. This is crucial not only from an environmental standpoint and for ensuring the durability of the building, but also for reducing financial expenses, which is highly important in today's context.

A comprehensive analysis of literature related to the field was conducted, and the functional roles of software tools were examined. Based on this, the organization of training sessions in accordance with the topic and objectives was justified to ensure they are both effective and suitable for learners' comprehension.

In a society where science and technology are rapidly advancing, successfully implementing educational reforms requires the improvement of the learning process in technical higher education institutions and its alignment with international standards. This must be organized based on the demands of partner enterprises [5; p. 42]. Currently, there exists a discrepancy between the requirements placed on future specialists and the practical professional knowledge and skills possessed by graduating students.

Based on the system of training highly qualified personnel, natural sciences—which were previously regarded solely as fundamental disciplines—are now recognized as a core element essential for the in-depth study of specialized subjects. Therefore, each topic must be explained with consideration for its relevance to the specialization, its application in production, and the inclusion of field-specific problems. This approach has been proven to yield positive results.

Solving professionally oriented problems during practical sessions not only deepens students' understanding of the subject but also fosters their initial skills in conducting scientific research in the field of architecture. This, in turn, enhances the effectiveness of education and creates opportunities to better meet the demands placed on highly qualified specialists.

Students are expected to interpret models that help them develop professional competencies. In addition, assigning tasks such as creating models of residential buildings and explaining the materials used in them fosters students' interest in the construction profession.

By showing the image, the instructor addresses students with several questions:

How many rooms are shown in this image?

What materials were used in the construction of the house?

What types of work did the builders carry out during the construction of this house?

What aspects were given special attention during the construction of the house?

Figure 4. Modern House Design (125 square meters)

The professor explains the following information to students about the compact and comfortable house design:

As we know, many people around the world today are concerned about securing housing, and the soaring prices are causing significant stress. In such circumstances, there are those who are considering affordable, compact homes that do not fall short of luxurious buildings. One such individual is designer Chris Heining, who proved that it is possible to build a low-cost yet aesthetically pleasing home.

This house design, which occupies 125 square meters, is fully equipped—from the kitchen and bathroom to the bedroom on the second floor—without any shortcomings (see Figure 4).

During the completion of independent assignments, students are divided into small groups. Each group is given a topic related to their specialized subject for practical exercises. The groups thoroughly study the content of the practical topic and, based on the curriculum, develop a technological map, complete assigned tasks, study relevant literature, and independently gather materials from internet sources and other references. The groups that achieve the best results and deliver effective presentations receive the highest scores.

In this process, the professor-instructor ensures that students theoretically study the selected construction object, directly observes their activities, and organizes the educational process to deepen their knowledge in their area of specialization.

Thus, providing students with essential knowledge related to the construction profession and preparing them for the independent assimilation of scientific and technical achievements depends on the pedagogical skills of the professor-instructors. Successfully organizing and conducting the lesson strengthens students' professional competencies. Here, the instructor pays close attention to ensuring alignment between the academic curriculum and the subject-specific program.

If the professor-instructor clearly explains the educational objectives and tasks during the teaching of specialized subjects, students develop the ability to solve problems quickly and easily. Additionally, providing complete and accurate information about the topic enhances the quality of education and supports students in independently mastering the content related to the profession of construction and finishing works.

CONCLUSION

In technical higher education institutions, the distinctive features of developing students' professional competence through software-based educational tools lie in their ability to influence students' consciousness, promote deep mastery of construction and finishing works, and foster the formation of practical skills and expertise. In this process, textbooks, educational manuals, visual didactic tools, charts, models, mock-ups, educational-technical resources, and structured learning activities play a crucial role in the teaching and educational

process.

REFERENCES

Ветлугина Н.О. Организационно-педагогические условия применения мультимедиа технологий в повышении эффективности подготовки бакалавров профессионального обучения. Диссертация. Екатеринбург – 2016. 181 с.

Вербицкий, А. А. Компетентностный подход в образовании [Текст] : проблемы и условия реализации / А.А. Вербицкий // Байкальский психологический и педагогический журнал. — 2006. — № 1-2 (7-8). — Б. 25

Кулагин В.П., Механов В.Б. Освоение информационных технологий: предложение и спрос // Информационные технологии. – 2004. №10. – С. 53.

Кларин М.В. Интерактивное обучение — инструмент освоения нового опыта // Педагогика. 2000. — №7. — С. 12-19.

Кукушин В.С. Теория и методика обучения. -Ростов-на-Дону: Феникс, 2005. -476 с.

Панфилова, А.П. Игровое моделирование в деятельности педагогика. – М.: «Академия», 2006. – 368 с.

ROBERT I. V. et al. Forecast of the development of education informatization //Revista Espacios. – 2017. – Т. 38. – №. 40.

Rasulov I. M. ADVANTAGE AND METHODOLOGICAL PROBLEMS OF TEACHING COMPUTER SCIENCE IN MODERN SCHOOLS //Ученый XXI века. – 2022. – С. 22.