

**USE OF PEDAGOGICAL AND INFORMATION COMMUNICATION
TECHNOLOGIES IN TEACHING DESIGN PROBLEMS**

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ABSTRACT: This article highlights the pedagogical capabilities of organizing the teaching process of design and drafting problems in higher education institutions based on modern pedagogical approaches and information and communication technologies (ICT). The limitations of traditional teaching methods are analyzed, and the advantages of utilizing interactive methods, computer graphics software, and multimedia tools in the learning process are demonstrated. The study proposes methodological recommendations for developing students' spatial imagination, independent and analytical thinking skills, as well as professional competencies through innovative technologies.

Keywords: pedagogical technology, information and communication technologies (ICT), design problems, drafting, spatial imagination, interactive methods, computer graphics, educational efficiency.

АННОТАЦИЯ: В данной статье освещаются педагогические возможности организации процесса обучения задачам проектирования и черчения в высших образовательных учреждениях на основе современных педагогических подходов и информационно-коммуникационных технологий (ИКТ). Проанализированы ограничения традиционных методов обучения, показаны преимущества использования интерактивных методов, программ компьютерной графики и мультимедийных средств в учебном процессе. В исследовании выдвинуты методические рекомендации по формированию у студентов пространственного воображения, навыков самостоятельного и аналитического мышления, а также профессиональных компетенций с помощью инновационных технологий.

Ключевые слова: педагогическая технология, информационно-коммуникационные технологии (ИКТ), задачи проектирования, черчение, пространственное воображение, интерактивные методы, компьютерная графика, эффективность обучения.

ANNOTATSIYA: Mazkur maqolada oliy ta'lim muassasalarida loyihalash va chizmachilik masalalarini o'qitish jarayonini zamonaviy pedagogik yondashuvlar hamda axborot-kommunikatsiya texnologiyalari (AKT) asosida tashkil etishning pedagogik imkoniyatlari yoritilgan. An'anaviy o'qitish metodlarining cheklovlari tahlil qilinib, dars jarayonida interfaol metodlar, kompyuter grafikasi dasturlari va multimedia vositalaridan foydalanishning afzalliklari ko'rsatib o'tilgan. Maqolada innovatsion texnologiyalar yordamida talabalarning fazoviy

tasavvuri, mustaqil va tahliliy fikrlash ko'nikmalari hamda kasbiy kompetensiyalarini shakllantirish bo'yicha metodik tavsiyalar ilgari surilgan.

Kalit so'zlar: pedagogik texnologiya, axborot-kommunikatsiya texnologiyalari (AKT), loyihalash masalalari, chizmachilik, fazoviy tasavvur, interfaol metodlar, kompyuter grafikasi, ta'lim samaradorligi.

INTRODUCTION. The integration of modern technologies in the field of education is one of the key factors of today's era. Undoubtedly, taking into account the specific characteristics of modern students and society, a teacher must, in addition to the knowledge gained in their specialty, also possess pedagogical and psychological knowledge, as well as be capable of utilizing new pedagogical technologies and modern information tools in the teaching process. There is no doubt that this process requires teachers to have extensive practical experience.

Organizing the teaching process of design problems in higher education institutions on the basis of modern pedagogical approaches and information and communication technologies is one of the pressing tasks. In particular, by integrating theoretical knowledge with practical activities in design problems in drafting, students develop spatial imagination and thinking, independent decision-making skills, and professional competencies. For this reason, the use of innovative educational technologies in this process significantly increases the effectiveness of learning.

RESEARCH METHODOLOGY. Teaching design problems encompasses processes such as enhancing students' spatial imagination, developing creative ideas, and improving the theoretical recommendations for developing skills in creating and reading object drawings. Methodological developments, handout materials, slides, animations, and interactive methods in teaching ensure the quality of "Drafting" lessons and effective organization of the teaching process.

Technology – the totality of methods and approaches used in a particular activity, art, or craft.

Pedagogical technology – This is the process by which a teacher (educator) exerts influence on students (learners) in a specific sequence and condition using teaching (educational) tools, and as a result of this activity, forms predetermined personal qualities in them.¹

Many scholars have provided definitions of pedagogical technology. We summarize and present the definition proposed by UNESCO: "Pedagogical technology is a systematic method of creating, applying, and defining all processes of teaching and knowledge acquisition using human and technical factors and their joint interaction, aimed at the task of intensifying the forms of education."

In the application of any pedagogical technology, the basic and auxiliary principles (principles) of didactics are always observed:

- from the known to the unknown;
- from the simple to the difficult or complex;
- from the concrete to the more abstract;
- from observation to theoretical generalization;
- from the general or ordinary to the specific or unusual, and others.

¹ Abdurazzoqov I., Boboqulov E., Lolayev B. "Pedagogik texnologiya turlari va dars modullari" Journal of new century innovations 5-son 2024-yil.

As revealed during the research, limiting the teaching of design problems to traditional explanations does not sufficiently develop students' independent thinking. For this reason, the application of modern pedagogical and information communication technologies in teaching design problems serves to increase the effectiveness of education. In particular, through interactive methods, computer graphics programs, and multimedia presentations, students develop spatial imagination, analytical thinking, and creative approaches. Such an approach encourages students not merely to receive ready-made knowledge, but to engage in independent inquiry, analyze problems, and find optimal solutions.

ANALYSIS AND RESULTS. In implementing modern educational technologies, it is important for students to achieve effective results in a short time without excessive mental and physical burdens. In this process, along with conveying the necessary theoretical knowledge to students, developing their skills and abilities on the basis of practical activities, and systematically monitoring the educational process are of particular importance. Furthermore, opportunities arise to assess students' acquired knowledge, practical preparedness, and professional potential.

Such an approach increases students' interest in practical exercises and requires a high level of pedagogical skill and innovative approaches from teachers. As a result, the effectiveness of the educational process increases, and students' independent thinking and creative activity develop.

Innovation (from English) – means introducing novelty, novelty, change, a term mainly associated with science and technology. However, it is becoming increasingly widespread that innovation is being applied on a broad scale in human life-related activities, particularly in the pedagogical educational process, where great achievements are being made in teaching and upbringing through new technologies.

In addition, ICT enables step-by-step demonstration of the design process, rapid identification and analysis of errors. This strengthens collaboration between teacher and student, creating conditions for individualizing the educational process.

If we view artificial intelligence as a complex of intelligent systems capable of analyzing, learning from, and drawing conclusions from large volumes of data, it would not be an exaggeration to say that its use in the educational process can compete with pedagogical technologies and ICT in analyzing students' knowledge levels and further developing their interests and abilities. This is because the use of modern pedagogical technologies in the teaching process broadens students' creative thinking horizons. The following didactic games can be recommended to ensure their success in design work.

Game 1. “Who Can Build the Model More Accurately?”

Game condition. Based on images of wire-made parts, students must create models of these objects.

Game objective. Through this game, it is intended to develop students' skills in reading drawings, improve their spatial thinking and ability to estimate objects visually, and enhance their ability to independently make various shapes.

Required equipment. Images of wire-made parts drawn in a clearly visible size for students and their pictorial views (Figure 2.4.1), as well as pieces of aluminum or copper wire.

Game procedure. A poster showing the views of wire-made parts is hung on the board, while the pictorial views are covered. Wire pieces are distributed to all students and they are given the task of preparing models based on the given views. During the model-making process, students approximately determine the proportions between parts of the detail. Unnecessary excess wire

pieces may be cut off or folded. If students have difficulty making the model, the pictorial views are revealed briefly.

Note. Before starting the game, if exercises are performed with students to create models of various geometric shapes from wire – squares, parallelograms, rhombuses, circles and other shapes – and draw their views, the effectiveness of the game will increase even further.

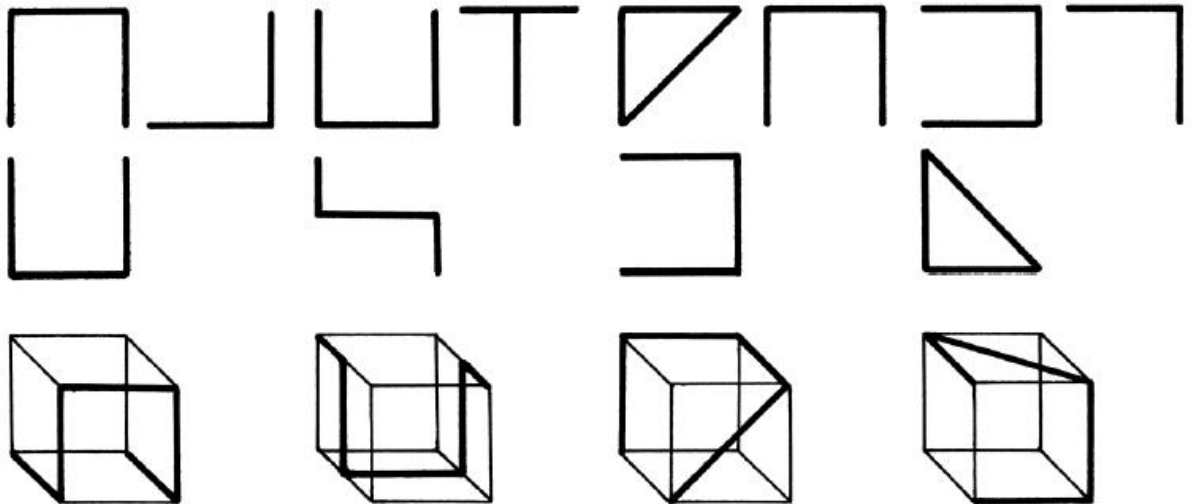


Figure 1

Game 2. “Identifying the Most Appropriate Option”

Game condition. Based on the given pictorial view of a part, students are required to identify the most correct and standard-compliant variant from among several views (Figure 2).

Game objective. Through this game, it is intended to develop students' knowledge and skills in reading and analyzing drawings, as well as to form their understanding of standard requirements in the subject of drafting.

Required equipment. Five circles with a diameter of 250 mm are prepared. One of them is divided into four sections, while the remaining four are each divided into three sections, all separated into sectors through the center. Pictorial views of four different parts are placed in the four-sector circle. Three variant views of each part are drawn in the three-sector circles (Figure 2). The four-sector circle in the center is placed in a fixed position, while the other circles are arranged so that they are attached to it and can rotate freely.

Game procedure. The teacher demonstrates the pictorial views of the four parts depicted in the central fixed circle and explains that students must select the most correct view – the one that fully meets the standards – from the three variants given in the surrounding rotating circles, and rotate it to the corresponding position. It is particularly emphasized that the variant selected must comply with all standard requirements for depicting the part.

The student who is the first to identify the most correct views corresponding to the pictorial view of the part is declared the winner of the game.

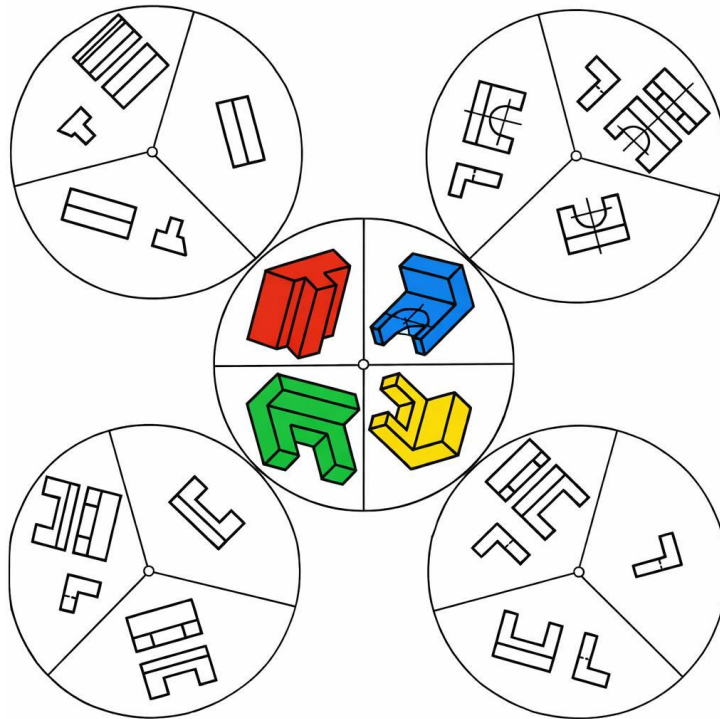


Figure 2

Through these didactic games, it is possible to ensure not only the expansion of students' creative thinking horizons, but also their activity during the learning process.

The use of modern pedagogical and information-communication technologies in the teaching of design problems in drafting is one of the important factors for increasing educational effectiveness. While traditional teaching methods produce certain results in conveying theoretical knowledge to students, they are not sufficient to fully develop their independent thinking, creative approach, and spatial reasoning. For this reason, the introduction of interactive methods, didactic games, and innovative pedagogical technologies into the educational process is of paramount relevance. In the course of the research, it was established that organizing design problems in harmony with practical activities significantly develops students' skills in reading and analyzing drawings, their professional competencies, and their ability to make independent decisions.

Furthermore, in applying pedagogical technologies, it is essential to adhere to the basic principles of didactics, and to organize the content, objectives, and assessment system of teaching in an interconnected manner. This creates a foundation for training competitive, creatively thinking specialists who meet modern technical requirements in the field of engineering graphics. Thus, the systematic use of modern pedagogical approaches, artificial intelligence, and ICT tools in teaching design problems elevates the quality of education to a new level.

CONCLUSION AND RECOMMENDATIONS. The theoretical and practical aspects of using modern pedagogical and information-communication technologies to develop students' creative thinking in the process of teaching design problems in the subject of drafting were analyzed. The results of the research demonstrated that, although traditional teaching methods produce a certain effect in imparting theoretical knowledge to students, they are unable to sufficiently develop their independent thinking, creative approach, and spatial reasoning.

Throughout this chapter, it was substantiated that the application of pedagogical technologies, interactive methods, didactic games, as well as ICT and artificial intelligence technologies in teaching design problems is a key factor in increasing educational effectiveness. In particular, it was found that the use of programs with artificial intelligence elements such as AutoCAD, Fusion 360, SolidWorks, and PixVerse AI helps students to more deeply understand complex design processes, and contributes to the development of skills in analyzing and visualizing drawings. Moreover, it was proven that classes organized on the basis of didactic games and innovative approaches increase students' activity in the learning process and encourage them toward independent decision-making, problem analysis, and finding optimal solutions. The integration of pedagogical technologies and artificial intelligence tools strengthens collaboration between teacher and student, creating the opportunity to individualize the educational process.

In conclusion, the systematic and purposeful use of modern pedagogical approaches, information-communication technologies, and artificial intelligence in teaching design problems in drafting is an essential condition for developing students' creative thinking, forming their professional competencies, and bringing the quality of education to a new level.

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