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# METHODS OF USING GRAPHIC PROGRAMS IN THE FIELD OF CONSTRUCTION DRAWING

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## ABSTRACT

*Electronic form of assessment of students' knowledge in the field of construction drawing in higher education.*

**KEYWORDS:** *Construction, Independent Learning, Test, Drawing, Computer Graphics, Graphics Software, Construction Drawing.*

## INTRODUCTION

The current advances in science and technology have changed the requirements for graphic training of university students. The technology of teaching graphic sciences has developed significantly. The modern educational space is filled with the latest software and multimedia graphics packages and complexes. One of the main requirements for student competencies in the curriculum is the acquisition of computer graphics. Therefore, today there is a need to improve the teaching of graphic sciences, especially construction drawing.

## MATERIALS AND METHODS

Yu.F. Katkhanova notes: "The high pace of development of computer technology leads to a natural reassessment of the attitude not only to the existing knowledge system, but also to the search for new ways to improve traditional teaching methods and techniques."

The difference between methodology and technology can be explained as follows:

- Methodology, in our opinion, is the content of education aimed at the goals of teaching, a joint set of teaching organization. Methods, techniques, and methods or methodological systems that have the same content can produce two different outcomes for two teachers;

- When using pedagogical technology, different teachers can achieve the same results, even if they use different approaches, different tools and methods.

Learning technology is a means of teaching in which the primary function of the task is to perform the task with the help of human management. In educational technology, the focus is on teaching aids: the educator does not teach students, but directs them to activities, acts as an incentive, and manages the educational tool. The teacher's pedagogical skills include the selection of relevant content, the use of effective teaching methods and tools in accordance with the program and pedagogical objectives.

One of the most effective ways to choose technology is through a multimedia approach. The following are important factors to consider when choosing a technology for your learning:

☐ The importance of using new technologies in the learning process to achieve the goals of education, not the technology itself;

☐ In addition to the most modern, expensive technologies, cheap and traditional technologies can be effective;

☐ learning outcomes do not depend on the type of information and communication or information technology, but on the quality of course creation and transmission;

☐ It is important to pay attention to the personal characteristics of students, the specifics of the field of study, the content of assignments and exercises in the selection of technologies.

Technology does not negate or replace methodology, didactics and educational theory. It develops specific algorithms, constructs the learning process, and identifies clear and definitive ways to achieve guaranteed results.

A modern lesson is a set of non-standard ways and means of teaching, in which the teacher mobilizes all his skills to achieve certain educational goals and engages students in the process. Their ability to focus on learning new things. It is the use of non-traditional forms of education.

According to LOMokresova, the use of innovative forms of education in the teaching of graphic sciences: teaching students to make product drawings using computer graphics, reading video lectures with the help of multimedia equipment, teaching science on electronic media for independent study It is connected with the creation of a methodological fund, the use of existing methodological resources through the conversion of the main methodological developments of the department into electronic form, and others.

According to S.A. Freiberg, the search for answers to the traditional question of didactics determines the results of the search for teaching methods. But the teaching method is complex, multidimensional, and there are no "pure" methods. In any educational process, several methods are involved at the same time, complementing and interchangeing.

Based on the analysis of LV Pavlova's experience of innovative teaching methods, the quality of learning materials in engineering and computer graphics depends on different teaching methods,

for example, associative-cooperative method and descriptive analogy method increase the success of teaching. The purpose of these methods is to develop spatial imagination, the formation of creative, cognitive and engineering-design maturity of students.

Researcher TVChernyakova, using the model teaching methodology of the subject "Computer Graphics", identified the level of teaching methods, all components, ie scientific advice, their interrelationships, principles, methods, tools and forms, and developed scientific recommendations for teaching science. This model provides psychological and pedagogical training of students in the teaching of "Computer Graphics" to university students, the need to master the subject, to determine the level of interest in science on the basis of levels, methods, tools and forms.

While OAKrainova developed a scientific and methodological basis for the design of a methodical system of teaching computer graphics in universities for the specialty "Computer Science", ANKostikov scientifically substantiated the methodology of teaching computer graphics to future teachers of computer science, providing them with in-depth knowledge and logic. Recommendations were given to ensure the connection of computer graphics with computer science, the development and preparation of educational and methodical complex of "Computer Graphics".

In his research, EI Roziev created an integrative course "Graphics" and developed a method of teaching it. It describes the problems of teaching Computer Graphics and its connection with other subjects, as well as the graphic requirements that a teacher of this subject must have.

Korean scientist Z.Zuo conducted research on the introduction of computer technology in the teaching process of "Computer Graphics" and the improvement of teaching. In his research, he argued that Computer Graphics should be integrated with the disciplines of Descriptive Geometry and Engineering Graphics.

In her research, AB Puzankova believes that the use of appropriate pedagogical technologies is required to significantly reduce the number of students with learning disabilities at all stages of education through the computerization of general technical subjects.

According to JJ Djanabaev, it is necessary to accelerate the educational process, purposeful information preparation and computerization. The use of new pedagogical technologies in teaching, computerization, provides the basis for accelerating the learning process.

All teaching methods have their strengths and weaknesses, so they need to be used in harmony, depending on the purpose, the circumstances, and the time available. The quality of education is the sum of the quality of teaching and upbringing.

**RESULTS AND DISCUSSION**

Yu.K. Babansky highlights the 7-step algorithm of "effective choice of teaching methods":

1. Decide whether the material will be mastered independently or under the guidance of a teacher. If the student is able to study the material independently and deeply enough without extra time and effort, the teacher's help will be superfluous.

2. Determining the compatibility of reproductive and productive methods. If conditions allow, attention will be paid to productive methods.

3. Determining the compatibility of inductive and deductive logic, analytical and synthetic ways of knowing. If an empirical basis for deduction and analysis has been developed, deductive and synthetic methods are fully suitable for adults.

4. Measures and means of compliance with oral, visual, practical methods.

5. Address the need to introduce incentive methods for students.

6. Methods of control and self-control, interval, definition of "points".

7. Develop resource options for deviations from the planned learning process.

We agree with Ye.Yu.Jokhova, taking into account the conditions of teaching engineering computer graphics, the time allocated to science and the specifics of graphics programs. In her research, Ye.Yu.Jokhova cites the peculiarities of computer-assisted teaching methods. According to the author, there are four main types of computer-assisted learning:

- Demonstration explanation;

- reproductive;

- problematic;

- research methods can be used.

The reproductive method of teaching using computer technology allows the teacher and the computer to master the knowledge transmitted to the student and to increase the material studied and apply it in similar situations, to organize the activities of the student. The use of this method with the help of a computer can significantly improve the quality of the organization of the educational process, but it does not allow to radically change the educational process compared to the traditional scheme (without a computer). The use of problem and research methods in this regard is more reasonable.

Problem-based learning uses the capabilities of a computer to describe and organize the learning process and to find solutions to a particular problem. The goal is to maximize student motivation. It involves solving different types of problems based on the knowledge gained in the learning process, as well as extracting and analyzing a number of additional knowledge needed to solve the problem. At the same time, special attention is paid to the skills of collecting, analyzing and transmitting information.

The research method of computer-assisted teaching provides students with independent creative activity in the process of conducting scientific and technical research on a particular topic. The use of this method is the result of active research, discovery and play. As a result, it is more successful than any of the other methods listed above. The research method of teaching involves the study of the ways in which objects and situations affect them. To be successful, you need an environment that responds to influences.

Undergraduate training requires the judicious use of classroom time to ensure that learning objectives are met in a context of reduced learning time.

In our opinion, it is appropriate to pay attention to the following factors that determine the effectiveness of education: the form of training;

- Selection of optimal combinations of teaching and control methods;

- Speed of training;

- Scientific, systematic and consistent connection of study with life;

- The optimal set of educational tools.

Modern pedagogy includes more than 20 organizational forms of teaching. Historically, as a method of communicating knowledge through communication, lecture is still one of the most intensive and important didactic systems, aimed at achieving the goals of the early and basic stages of education. The lecture began with a transition from individual to group training. The report lays the foundations for cognitive and cognitive activities such as attention, memory, imagination, and an adequate system of thinking. The lecture usually includes explanatory material that requires teaching methods such as proof and justification. Lectures are still the most common and important form of teaching.

There are two main types of cognition: verbal, speech-based, and visual. Some students have a tendency to accept verbal information, while others are required to convey information through images. At such times, it may be helpful to combine the two into a series of lectures. The demonstration method is a continuation of the historically established method of transmitting the experience of the older generation to the younger generation, which is based on the "do as I do" rule. Modern interpretations of this method include visual representations of events, processes, problem-solving methods, and ways to use a variety of tools. Demonstration does not involve unconsciously copying certain actions that lead to the desired result, but is one of the components in getting your opinion on the topic being studied. According to LB Grigorevsky, there are not enough textbooks and manuals on the subject of engineering computer graphics, which is one of the disciplines of engineering graphics, so lectures are one of the most important and basic means of conveying information to students. In addition, the teacher provides information on the new course in the form of separate topics and sections, which the student should collect from various sources.

The visual organization of the learning process in construction drawing also leads to the comprehension of the demonstration learning materials, their conscious and thorough mastery, and the stabilization of attention. Demonstration materials should be appropriate to the type and topic of the lesson, appropriate to the student's age and level of knowledge, and their use should be organized using effective methods and tools. Visual aids in Construction Drawing can vary depending on the type of lesson and the topic. Including:

Printed materials (posters, handouts, etc.).

Materials in electronic form (presentations, forms, pictures, etc.).

Animated materials (multimedia e-books, e-textbooks, etc.).

Vitrual models (details, house models, machine mechanisms and models).

You can use ArchiCAD, AutoCAD, 3ds Max, Revit, Sketchup to create virtual object models. Because these programs are designed for computer modeling. For teachers of construction drawing, it is recommended to create mainly in ArchiCAD. First of all, the ArchiCAD program

is adapted to international standards and provides all-round convenience for the teacher. Second, the program is designed to work in accordance with the rules of the construction industry.

The visual model of the virtual model of the created object, that is, in terms of design, has a wide range of possibilities in the graphics program ArchiCAD itself, in which the material and color of the building is much more convenient than other graphics programs. The reason is that in the process of creating a model of the building, the program itself offers standard materials in accordance with the building components. This brings a number of conveniences to students. ArchiCAD has many advantages in working with virtual building models, making it interesting and understandable for the user.

MS Word, PhotoShop, CorelDraw can be used to make posters. It is recommended that construction design teachers use MS Word and PhotoShop. It is convenient for teachers to enter and design texts using MS Word. PhotoShop has the ability to process and design images.

MS Word, ArchiCAD, Revit, Paint NET can be used to prepare handouts. With the help of these programs, teachers have the opportunity to design the text, graphic assignments and drawings required for the handout, the quality of which is based on modern requirements.

Multimedia lesson plans can be created using Adobe Flash, ArchiCAD, Snagit. Adobe Flash is one of the most convenient programs for animating various drawings and tasks in the field of construction drawing. ArchiCAD helps you create building facades, building models, and view them from different angles, trim, color, and more. The Snagit program is designed to videotape the process on a computer screen. With the help of Snagit video recording of all activities performed in the ArchiCAD graphics program and its widespread use in all types of educational process, it is possible to set a high level of mastery of students.

In today's world of technology, there are e-books, textbooks, manuals, and more. They are mostly verbal and serve as a source of information for users. There is a need to create a multimedia e-book on the subject of construction drawing. In this case, the study of theoretical information on the subject will give students a clear idea of the graphic drawings in the form of animation. Based on this, it is possible to perform the tasks correctly based on this knowledge in the process of performing graphic tasks. If you encounter a problem while completing a graphic task, you can use problem-solving examples on the topics in the task set section of the multimedia e-book. The advantage of this is that when faced with a problem in the execution sequence, it is possible to have a clear understanding by going back.

The e-textbook covers the didactic cycle of the whole educational process: theoretical data, animation of problem-solving sequences, use in the educational process, control of the level of knowledge and the availability of information retrieval system. differs from other textbooks.

The use of color computer animation allows you to control the process of extracting and presenting the necessary information, high-quality graphics, video fragments, schemes, formulas, the subjects of the studied subject are presented in a series of presentations or connected in the form of a branched dynamic chain. .

The multimedia e-book is used for the following lesson purposes:

Learning objectives: to teach students the theoretical information on the subject through spatial imagination and to organize the implementation of graphic tasks on the basis of this knowledge in the course of practical lessons.

Educational goal: to gain a clear understanding of the sequence of theoretical and practical knowledge on the subject through spatial imagination and its application in real life as a necessary tool, to develop the skills of independent work and creativity.

Developmental Objective: To develop the ability to turn knowledge into a skill and a skill into a skill based on the spatial imagination developed on the topic being studied and to work independently.

The use of computers as a didactic tool in the development of design and technological creativity of students gives effective results. This is because a modern computer tool is a useful tool for the ability to apply theoretical knowledge in practice and to quickly and objectively determine the level of mastery of the acquired knowledge and skills.

A video lesson is a lesson plan that helps a user (student, specialist, etc.) to see and hear specific knowledge and skills in a video format, both visual and audio.

There are the following types of video lessons:

Directly observe the process of Lesson 1 and involve the educator (speaker-teacher), who will have the opportunity to see, hear, learn and master the information.

2 describes a process that can only be performed aloud or silently without the participation of the given educator.

Therefore, as mentioned above, the organization and application of video lessons in the educational process is relevant today.

There are video lectures on science in Uzbek. But there is not enough information about practical training. In particular, the lack of video tutorials for drawing a sequence, ie an algorithm, does not meet today's needs. This can be used as an example of drawing assignments. Because in each lesson, the teacher draws and explains to the students a sample assignment on the topic of the practical lesson. Observations and analysis show that students are given a variety of questions and problems in the process of completing the assignments independently. If the student is someone who gives insight or advice to complete the task, he or she will complete the task. Students are often at home during practical assignments, when there is no one to teach them. As a result, the student can find his teacher the next day (if he can find one) and ask him to draw places he does not understand. Otherwise the work will not be completed.

Video tutorials can be a positive solution to these problems. Students can download video lessons on computers, tablets and smartphones. This allows students to repeat the lesson as many times as they want (that is, until they have mastered it). This will ensure that the student's learning is at the required level.

Students should be able to draw and read drawings, graphs, and shapes in the technical sciences. This requires a good set of assignments. The need to redesign a set of quality graphic assignments is pending. To find an optimal solution to this problem, it is necessary to create an electronic version of a set of graphic tasks in science.

Level Graphic Task - Develop students' graphic assignments from simple to complex.

M. Sroka, B. Radovan, T. Jelena, H. Stachel, Zongyi Zuo, Kaiping Feng, Bing Chen, J.J. Djanabaev, A.K. Hamrakulov, N.D. Yadgorov, D.S. Saidakhmedova, A.A. Kakhkharov, D.Sh.Dilshodbekov and others, TSBorichevsky, VPMatanov, LMPyjevich, P.Odilov, A.Ashirboev, T.Rixsiboev, A.Valiev gave scientific recommendations on creation of graphic tasks.

PV Zelyonyy and Ye.I. Belyakova developed a set of tasks on engineering graphics, focusing mainly on the department of descriptive geometry. In addition, graphic tasks are not divided into levels of complexity.

PV Zelyonyy and Ye.I. Belyakova developed a set of tasks from engineering graphics to projection drawing. They are also presented in the form of colored details, as well as isometric (clear) images. But the principle of simple to complex is not taken into account.

Written by Volkhinym K.A., Ilyushenko P.V. These options are available. But the tasks are not divided into levels of complexity.

The science of computer graphics, which is being studied today as part of the science of construction drawing, has such opportunities that it greatly contributes to the quality of the set of tasks being created in a short period of time. One of the best ways to handle this is to use ArchiCAD graphics software. This program makes it easier to develop science assignments than other programs.

For example, ArchiCAD graphics software can be used to create building design work, style part design, line types, building model, cuts and sections, and more.

Particular attention should be paid to their level when reorganizing the set of assignments on the topics. This results in an increase in spatial imagination and the development of creative and logical performance skills.

 Creating assignments in the field of "Construction Drawing" from simple to complex and applying them to the learning process has a positive effect on the development of students' spatial imagination. Because as the level of the task increases, the student is required to have a strong spatial imagination. A student with a developed spatial imagination can think creatively. As a result, they develop creative skills based on their knowledge and have the opportunity to create and implement new ideas.

The work of Zorana Jelly, Branislav Popokonstantinovic and Misa Stojicevic also mentions the use of virtual teaching methods in the teaching of engineering graphics. It is also recommended to provide drawings and a 3D model of it, as well as the possibility of creating virtual detail models. However, there is no approval for level assignments.

According to the experience of Zongyi Zuo, Kaiping Feng, Bing Chen, " ... it is effective to use the possibility of 3D modeling of computer graphics to hand-drawn sketches. Students complete most of the assignments throughout the semester using computer graphics. Using ArchiCAD and other 3D software to create three-dimensional graphic tasks on a computer based on the design, seeing them directly will help students develop their imagination. "

One of the main goals in teaching the subject "Construction Drawing" in our country is to re-analyze and group the topics and to distinguish those that are suitable for organization on the basis of computer graphics and to develop skills in computer drawing and modeling based on modern requirements. The use of a set of level assignments in the teaching of "Building Drawing" is effective and gives positive results.

Now let's look at the order in which a practical exercise is conducted.

The first phase of the training includes: the interfaces and basic toolbars of the ArchiCAD graphics program, which are related to the construction industry; coordinate systems; two- and three-dimensional drawing environments are re-explained and demonstrated to students using the comparison method. Students will be introduced to the graphics program. They try to understand the similarities and differences between the program's interface, toolbars, and commands. The teacher teaches the students, the students practice on the computer.

For example: Explain the choice of two-dimensional or three-dimensional media in applications. When you start ArchiCAD, you can select a two- or three-dimensional environment from the Info menu, or you can switch from the keyboard to the two-dimensional or three-dimensional state using the F2 and F3 keys. ArchiCAD software allows you to change the environment at any time (Figure 2).
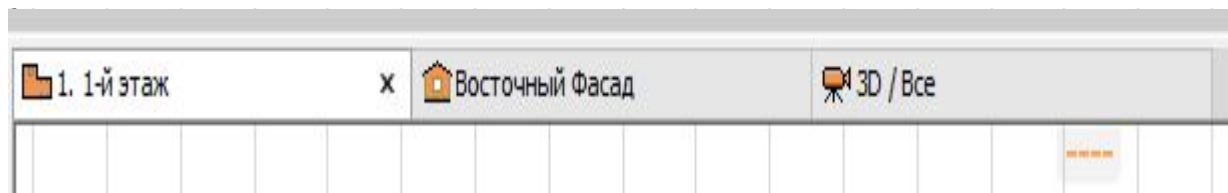


Figure 2.Selecting a working environment in Archi CAD

The second stage of the practical training includes: drawing two-dimensional (flat) drawings of different complexity; sizing; change line types, colors, and thicknesses; adjust the drawing font; drawing and saving graphics are taught by comparing the hardware and commands of graphics programs. The teacher shows an example and the students repeat it in a graphic program. Once the teacher has completed the sample, students will be able to complete a simple task on their own.

For example: explain how to do a three-room project work drawing.

The teacher will explain this task in ArchiCAD, which is one of the most convenient programs for the construction industry. Students follow the teacher's instructions on the computer one by one. In ArchiCAD, you can draw arrows (anywhere on the Constructions toolbar) using the Grid axis command to draw. The outer and inner walls of the project work on the arrows (using the command "Wall" in the toolbar "Construction") are drawn. Before drawing, the wall thicknesses and heights are adjusted by entering the dialog parameter command of the Wall command. When straightened, the outer and inner walls are drawn along the given axes. When the walls are finished, the frames and doors open. The frame and door are opened by the "Door" and "Window" commands in the "Constructions" panel.

In the third phase of the workshop, students will be taught how to build and trim three-dimensional virtual models of a building based on a drawing history by comparing the equipment

and commands of graphics programs. The teacher shows an example and the students repeat it in a graphic program. Once the teacher has completed the sample, students will be able to complete a simple task on their own.

## CONCLUSION

At the final stage of the practical training: the task is to create a clear picture of the project work. One of the advantages and disadvantages of the ArchiCAD graphics program is that it allows you to draw a clear image while drawing a two-dimensional drawing. The teacher does not take the time to draw a clear picture. Spends extra time simply making the necessary changes to the image.

Graphics programs allow students to expand and enrich their knowledge. In addition, students will be able to independently master the program by identifying the strengths and weaknesses, similarities and differences of the programs. The method used develops students' motivation to learn the subject and teaches them to compare other design programs in the modern graphics software market. In this way, they will be able to choose the most appropriate program for their activities.

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