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Sanjar Xudoykulovich Mardov

Tashkent Institute of Architecture and Civil Engineering
Teachers of the department of Engineering Graphics and Computer Design

THE PRACTICAL IMPORTANCE OF GRAPHIC PROGRAMS AND THEIR DESCRIPTIONS IN THE DEVELOPMENT OF STUDENT SPACE IMAGINATION IN TEACHING THE SUBJECT OF CONSTRUCTION DRAWING

Abstract: *the course of building drawing at the university is aimed at the formation of the graphic culture of students, as well as the creative potential of the personality. Most effective work in this area, especially in teaching construction drawing, is achieved through the use of modern graphics software. Among the graphics programs in the field of architecture in the field of architecture, ArchiSAD is the most advanced, which is an effective way to illustrate the day of a subject by transitioning to a three-dimensional state of drawings in the eyes of students. Therefore, the practical significance of graphic programs and their descriptions occupy a special place in the coverage of the whole essence of this science.*

Key words: *graphic education, construction drawing, graphic applications, graphics, information and communication, spatial imagination, architecture, drawing, didactics, engineering graphics.*

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Introduction

As we know, with the advent of book publishing in Europe in the 1840s, a new phase of reading culture began. Book education has gradually squeezed out all traditional forms of personal communication and laid an important foundation for mass education. At the same time, a new branch of science has emerged that is perfect for us in all respects - didactics, which in turn has formed a new image of the teacher, which in the form of textbooks convenient to teach all the innovations in science.

The emergence and rapid development of information and communication technologies that allow to remember, store, transmit and change information in the history of mankind will lead to the creation of a new educational paradigm of the XXI century - information culture. At the same time, these processes, in turn, increase the possibilities of student learning activities indefinitely and change the role of the educator. It not only conveys knowledge to students, but also serves as a "lottery" in the sea of

information, helping them to select the necessary information, understand it logically and use it effectively in their professional activities that meet the competence principles of modern education.

The current stage of development of society requires new requirements for the scientific level and competence of the specialist. In the context of increasing the amount of knowledge provided to students, the reduction of classroom classes leads to further improvement of the educational process. Improving the efficiency of the educational process is one of the main tasks of higher education, which can be solved through the use of modern information technology in the educational process.

Computer graphics tools have radically changed the approach to teaching methodology: visualizing invisible processes and events such as magnetic and electric fields, chemical reactions, etc., allows them to better observe and understand.

The effectiveness of the use of computer technology in education has been scientifically proven

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by PF Anisimov, PM Bitsirkin, AV Gololobov, YF Katkhanova, AM Leybov, AV Sobolova, F. Liarokapis.

Computer technology reduces the time required for mechanical repetition in the learning process. For example, instead of writing theoretical explanations of a lesson, students can copy the textbook to data carriers, which saves a certain amount of lesson time. The teacher's guidance and advice will be needed when completing schedule or course work, as well as course and diploma projects. The questions asked by the students are repeated from year to year. If these questions are included in the e-textbook, the time allotted for referrals and counseling will be reduced. If the test written control is organized using modern computer tools rather than the traditional method, it will save another part of the educator's time.

The use of computer technology in the discipline of "Construction Drawing" is developing day by day. The growing demand for computer graphics in recent years requires a more in-depth study of the subject of "Construction Drawing". Observations confirm that the science of computer graphics is being introduced as a new subject for technical directions in higher education. The science of computer graphics is based on the laws of descriptive geometry and engineering graphics. Trained engineers-teachers are required to independently perform design work on computer tools and graphics programs.

However, the above-mentioned research does not focus on the use of graphics programs (ArchiCAD) in construction drawing and their integral connection. In some works, a number of recommendations are given for the use of AutoCAD software in graphic design in construction drawing. To date, the use of this program in the field of construction drawing is not considered an effective tool. There are a number of factors to this:

- ArchiCAD software is mainly suitable for two-dimensional drawings;
- In ArchiCAD program two-dimensional drawings are performed separately (2d and 3d position of the object);
- It will be difficult for all students to understand the drawings drawn separately;
- ArchiCAD requires access to its functional commands to change the existing standard characters;
- The number of standard symbols in ArchiCAD is very small and they are also limited;

Within graphics programs, many programs have features that allow you to draw both 2d drawing and 3d model views at once. But most graphics programs will include state-of-the-art standards, some of which will not be available if some can be modified. This condition causes some inconvenience.

There are some BIM programs that are specifically designed for the construction industry. These are ArchiCAD, Revit, Lira, Grasshopper and others. Of these programs, the ArchiCAD graphics

program is the most convenient for explaining topics in the field of construction drawing. The following factors serve as a basis for this:

- ArchiCAD graphics software can work on computers that are not very powerful;
- Light performance of ArchiCAD (works the same in 2d and 3d drawings);
- Create both 2d and 3D drawings in ArchiCAD;
- The commands in the command panel are linked to the construction area;
- Easy to change the parameters of the symbols;
- Availability of the function of conversion of finished 3d models even in 2d case;
- Automatic execution of simple and complex cuts;
- Easy connection of models from elsewhere to the standard library and the ability to change their parameters as standard;
- Possibility to collect the prepared documents in one project album;

No scientific work has been done on the capabilities of the ArchiCAD graphics program and its integral connection with the drawing sciences. Only Russian experts have written a book about the convenience and capabilities of this graphics program. A. L. Lansov, Titov S., N. Malova, A. Dneprov, P. Vasilyev, E. Kustova, O. Ivanova, A. Orlov, K. Gleni, D. Ridder, V.G. Proxorskiy, E. Felistov, G.A. Jadayev described these scientists in detail in his book on the capabilities of the ArchiCAD graphics program.

In higher education institutions where the science of construction drawing is taught, it is possible to see the increasing practical significance of the science by introducing and multiplying computer graphics topics into science programs. Nowadays, science specialists are required to use computer literacy and graphics software. Using computer graphics in educational processes:

- spatial imagination develops;
- mastering rates will be high;
- the duration of memory storage increases;
- develops creative and logical thinking;
- new projects and opportunities for their creation;
- Provides some convenience and facilitation for students in performing graphic work related to construction drawing.

We know that organizing drawing lessons using graphic software and multimedia electronic textbooks has several advantages over teaching in traditional methods. They are:

- The quality of the course is at the desired level;
- Information on the subject is clear and concise;
- Drawings and objects related to science and to be explained are made in front of students with the help of computer graphics;
- will be able to see the 3d model of the constructed building in six views or in four views at once and clearly see the model from different angles;

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- the ability to make simple and complex cuts on the finished object and see these cuts at once;
- the ability to explain the lesson in a short time;
- The availability of glossaries for lectures on the topic, sets of assignments, test questions of different levels, terms in science can be used as an aid.

Passing lectures of variable type; training and retraining of teachers depending on the level of special, methodological and ICT competence; It is necessary to develop and apply in the educational process the scientific and methodological basis for the use of multimedia teaching systems of lectures [115, p. 18], which have methods of experiential assessment of the activation of learning activities of students in the report "Multimedia".

Multimedia tools have significantly expanded the visualization of the learning process: the use of models, graphics, colors, sound, video technology. This diversity allows for the modeling of a variety of learning situations, including learning games. In an effort to improve the quality of knowledge of future graduates, engineering graphics teachers strive to use a variety of technologies using a personal computer in learning situations.

During the course of construction drawing, students should draw a drawing on the board on the board and copy it into their notebooks. But often in construction drawing, it is not enough to show a single drawing on the board. In this case, the educator needs to use pre-prepared drawings. In addition, using the animation capabilities of graphics programs, it is important to show the drawings that have not yet been shown on the board, and to leave a deeper imprint on the essence of the topic in the minds of students. This in turn simplifies the explanation of complex topics and increases comprehensibility.

Creating a theme essence using computer graphics has the following advantages:

- Ability to work with several drawings simultaneously using graphics programs;
- simultaneous use of the drawing as a visual material;
- The quality of visual information on the screen is higher than the information on the auditorium board;
- Ability to simultaneously present proof of two-dimensional drawings in three-dimensional drawings;
- Materials for the department of construction drawing are easier to master due to the high visibility of the report;
- the possibility of accurate drawing of symbols in construction drawings;
- The text of the lecture will be complete for students;
- students have a better understanding of the drawings on the topic through 3D models;
- the speed of narration is higher than that of a normal report;

- if any student later has a question, the teacher can easily return to the previous drawing step by step;
- The similarity of the electronic lecture to the traditional lesson increases the interest in it, promotes the development of spatial thinking.

In addition to orthogonal drawings, the use of three-dimensional models of geometric objects and animated rollers helps to engage students emotionally in the process.

According to T.I. Tatarinseva's research, teaching using animation and other graphic information provides the following opportunities:

- increase information retention by 10%;
- increase the reception (understanding) of information by 30%;
- Increases the student's involvement in the learning process;
- Reduces training time by up to 50%;
- The use of images allows to increase the efficiency of the learning process up to 89%;
- Animations significantly improve data perception compared to statistical images.

According to V. Knyazikov, the use of information technology in the educational process implies the following principles:

- expediency (the use of computer technology should be justified in each case, based on methodological and practical needs);
- dynamism (gradual introduction of graphics and other programs throughout the learning process).

The traditional method of teaching using pencil and drawing tools is a thing of the past. In the training process, after obtaining a paper sketch of the studied detail, it is more expedient to create a three-dimensional electronic model of the detail than to make its working drawing on paper in the traditional way. The model obtained in the automated design program allows you to perform working drawings in accordance with the Unified System of Design Documentation of the part (KHYaT) and revise them in accordance with the requirements of international standards.

The use of graphics programs in the study of engineering graphics helps to develop students 'research, enhance students' use of theoretical and practical knowledge. These are the main tasks facing higher education today.

Today, there are many different graphics programs that allow you to create electronic models of plans in construction drawing or a number of construction-related items. BIM and Autodesk, two of the companies that create graphics applications that allow the creation of such models, have taken the lead. Modeling such objects in the engineering graphics sciences helps them to be better understood by students and significantly increases visibility. Demonstration is a very important link, especially for the science of construction drawing.

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In the process of developing education, a skilled educator has the opportunity to implement a number of effective objectives, that is, the main assistant is an electronic textbook. The e-textbook is very effective, especially in the field of construction drawing. The reason is that animated videos, electronic posters turn out much better and clearer than the rest of the areas of drawing on topics related to construction. Because the animations on the construction theme are examples of objects that students have seen and encountered throughout their lives, students will find it easier and quicker to understand, which is an important step in achieving the goal set by the educator.

In addition, the e-textbook, prepared using modern computer technology, has a number of advantages, as well as the ability to solve problems that do not depend on the teacher, as well as replacing the traditional printed textbooks that we read. For example, if a teacher asks a question after drawing a diagram explaining a topic during the lesson, the student will not be able to go back to any stage of the drawing, as a result, students' mastery will decrease. In the electronic textbook, animated drawings have the ability to do this, as well as to show a clear view of the drawing.

Advantages of the electronic textbook:

- selection functions of materials;
- View animated materials in the desired speed sequence;
- Easy transition from one material to another;
- Use the textbook at any time and place;
- Simultaneous consolidation of textbook information through video clips;

The introduction of three-dimensional modeling computer technology in the educational process requires a reconsideration of the established traditions of teaching the science of engineering graphics. The most complete, accurate, and visual source of information about an object is its volumetric model. If necessary, design documentation can be submitted on electronic or paper media using it.

According to VA Nikolaev and AD Menshikova: "The main purpose of the three-dimensional system is to reduce time, improve the quality and feasibility of design results, automate documentation, improve the quality of design management. The use of automated design systems (CAD) will free the manufacturer from time-consuming repetitive drawing work, as well as simplify changes in product design.

Today, automated design systems are capable of not only 3D modeling, but also 4D modeling, i.e., parameterization, which significantly expands the scope of use. For example, the AutoCAD system is widely used in the education system: it allows you to effectively conduct training on topics such as connections, views, cuts, cuts, assembly drawings, detailing. In addition, the system allows the development of projects of machines and

mechanisms, buildings and structures. We do not always have the ability to demonstrate a particular learning object in a natural way, a virtual demonstration provides such an opportunity.

With the advent of the automated design system, many universities have begun to consider eliminating graphic geometry completely or partially in their curricula. More and more people in the engineering graphics sciences are recognizing the need to look for alternatives to descriptive geometry to develop spatial imagination.

AS Smirnov thinks it's too early to turn off the hand-drawn graphics:

"Because it's not photographic, it's conditionally accurate, so it's much more organic than a computer. The paradox is that hand graphics are humane, free and mobile in content, closer to nature, more environmentally friendly than computer graphics, and therefore something more modern."

NV Fedotova: "We believe that with the development of three-dimensional (3D) technology, the geometry of the drawing should be modified, the proportion of hand-drawn drawing should decrease."

In order to increase the effectiveness of education, computer technology should be applied organically to the learning process and traditional methods of learning. The rational introduction of modern computer technologies in the departments of engineering graphics not only combines mechanical, conventional handicrafts in the field of drawing geometry and drawing sciences, but also helps to develop students' creative and cognitive activity. That is, the combination of traditional technologies of graphic training and modern information technologies is an important principle in the learning process.

In all developed and developing countries, the application of an integrated approach to science is still one of the main pressing issues, so the role of computer graphics in the teaching process is changing significantly. Computer graphics is not only a source of learning for students and teachers, but also a basic learning tool. Because computer graphics is becoming a major tool in students' graphic preparation. The reason is that through computer graphics, the spatial imagination of students is emerging as a key factor in the effective and rapid development. All of this is our main goal, which is to revive the learning process, to motivate students to quickly and perfectly understand the essence of the topic.

In short, the essence of the topics mastered in the science of computer graphics construction drawing can be used as an object of study for electronic drawing, as well as as a tool in teaching the science of drawing geometry and drawing. This means that students from teachers of higher education institutions not only work in an automated design system, but also develop the skills to effectively use the capabilities of these software products in their future careers.

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