THE ROLE OF ENGINEERING AND COMPUTER GRAPHICS IN THE EDUCATIONAL PROCESS

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Abstract. *This article discusses the issues and approaches of teaching the subject of engineering graphics in technical higher educational institutions. Increasing the motivation of students to obtain the necessary competencies that allow them to read and execute drawings competently. And also provides the main methods of conducting classes using computer graphics programs.*

Keywords: *Engineering graphics, technical education, projection methods, three-dimensional modeling, graphic modeling, geometric modeling, logical thinking, visual image, orthogonal projections, project activity, computer technology, electronic textbook, interactive whiteboard.*

Introduction. Any project of mechanical engineering production cannot be imagined without a drawing. Drawing is a way of communicating technical ideas that is understandable to undergraduates in technical education. In order for students to study in the educational programs of higher technical educational institutions, after engineering and computer graphics, they should study such subjects as machine details and the theory of machine mechanisms. But "engineering graphics" has a special place among the subjects that form the basis of technical education. Without engineering graphics, it is impossible to become a competent specialist in the field of design and construction. Any person, even if they are far from technology, can encounter drawings in life. These are the drawings of the house or cottage under consideration, the repair plan or the placement of precious furniture in the room, not only technologists and designers in the enterprise, but also turners, welders, supervisors, managers from the sales and supply department, and even sales consultants of technical equipment stores in order to provide qualified advice to the customer.

Materials and methods. Since the main task of engineering graphics has traditionally been the study of projection methods and assembly drawing design rules, the demonstration focuses on the method of manual execution of time-consuming drawing and graphic work. The introduction of computers into the educational process greatly simplifies this problem. In modern conditions, when the idea of design changes, first three-dimensional modeling of technical objects is used more and more, and then it is necessary to form methods of automated design of types of views and cuts.

This led to the emergence of a new component in the teaching of engineering graphics - computer graphics. The essence of studying computer graphics is to create an integrated model based on geometric modeling. Its tasks include the formation of skills for working with specific packages of drawing programs; includes learning and practical development of methods of drawing on a computer, methods of automated production of graphic design documents, methods of computer-aided design of drawings using graphic databases.

Currently, there are two different approaches to the problem of teaching computer and engineering graphics and its role in training a high-level specialist.

The first approach is the most common – this is the study of computer graphics as a separate topic. With such an approach, computer graphics are considered as a science dedicated to the study of drawing techniques using "electronic drawing board" instead of a pencil and a drawing board [1].

At the same time, students do not have enough knowledge to use graphic computer technologies in the course and graduation work projects, and in the future they will additionally need to attend specialized design courses at manufacturing enterprises.

Such an approach is not justified, because computer graphics in general should be considered in a single context with engineering graphics [2]. Computer-generated views, but drawn with design errors, clippings lead to misunderstanding of the drawing and ultimately to incorrect assembly of the item in production. When working with a computer, students should not only master the AutoCAD graphic package, but also continue to study engineering graphics in order to understand the learning process and achieve the correct final result. In order to effectively study the topics of the educational process, it is necessary to reduce the number of hours allocated and overcome a number of shortcomings associated with the desire not to lose in solving pedagogical tasks, that is, to be able to develop spatial and logical thinking of students at the required level. Most students do not want to work with a pencil on paper because they do not draw at school, and many cannot correctly place a small-sized cut on format paper. In this case, working in a graphic editor can also help.

After all, for the student, the computer should become a tool along with the pencil and ruler. At the same time, in engineering graphics, the requirements master the methods and rules of drawing drawings with a pencil, and with computer graphics, they simultaneously learn the basic techniques and interface of the program, namely: setting the working environment, determining the drawing format, working with primitives, editing drawings, linking objects, blocks, connect with layers, texts, etc., learn to work with blocks, layers, texts, etc. At the same time, at any stage of drawing, the student can see a clear image of the object, which is very important in the learning process.

Results and discussion. When using information technologies in the educational process, the traditional tasks of engineering graphics are implemented in a new context. For example, it is easy to construct a 2D image of a "bullet" detail from a 3D clear image.

Implementation of the established task requires the creation of appropriate methodical instructions with step-by-step actions and explanations. The creation of a set of methodological instructions for performing drawings on a computer is in the process of development. All these tasks are performed like a manual drawing - according to the drawing line, while the drawing technique is developed, the methods of placement in the format and the rules of detail drawing in scale are taken into account. At the same time, you can always check the correct execution of the graphic task and correct the drawing in time. Using the same method, the teacher creates a geometric model of the detail specified in the task, and then automatically constructs its orthogonal projections using a three-dimensional model. By comparing his solution to the problem, the student can independently determine his mistakes and analyze the correctness of his solution.

The mistakes that students make in performing these tasks are related to the unclear representation of the model shape, and solving graphical problems of mathematical graphics can help with this. Such exercises are a preparatory stage for solving projection problems. They also

help teachers to identify which part of the learning material has not been mastered by students and immediately overcome difficulties in understanding the detail form [3].

Prospective undergraduates should be equally proficient in computer technology such as drafting and manual work. In addition, spatial perception is definitely more developed when performing flat images on paper format in construction and project activities, as well as in reading drawings in production. A person who does not know how to properly read and execute drawings on paper cannot do them correctly on a computer. Basic knowledge can be taught using pencils, clear images, layouts and models. The introduction of computer technology should be in reasonable amounts. We don't need to switch priorities. The computer graphics program should be aimed not only at learning the features and capabilities of the computer, but also at learning the rules and techniques for solving graphic problems.

At the same time, the introduction of computer technologies in engineering graphics classes allows us to implement the idea of educational development, increase the speed of the lesson, make the lesson more lively and interesting. Working with computer programs develops constructive and creative thinking, spatial imagination, helps to form knowledge and skills and abilities to work with graphic editors, meaningful ownership of information and its subsequent processing. Practice shows that the use of computer graphics increases the quality and efficiency of teaching, develops educational activities. At the same time, it effectively encourages students to learn. At the beginning of the academic year, it was interesting to observe that these same students, who did not know how to use a multimedia presentation, measured the detailed drawing on the computer screen with a ruler, and at the end of the training, they could easily draw the assembly drawing.

For us, the computer in the classroom has a wide range of possibilities that allow us to present this topic in a colorful and interesting way, prepare didactic materials along with the lesson, repeat the necessary constructions an unlimited number of times, and develop graphic tasks and tests for students. The use of computer technologies in teaching engineering graphics allows to fill many knowledge needs of students.

Conclusion. A sufficient material base for the use of computer technologies has been created in higher education institutions: there are computer auditoriums with interactive whiteboards equipped with a set of drawing programs. A student who has the skills to work with a computer can have a method of using computer technologies in any lesson.

In the lesson, using electronic textbooks, manuals, sets of practical work, thematic plans based on the lesson in engineering graphics were developed, which allows to save time during the preparation of the lesson and optimally structure the lesson process using modern computer technologies at various stages of the lesson.

The main result is to increase the motivation of students to study the science of "engineering graphics", as well as to better understand the topics and to apply it in practice, to improve personal abilities and to develop cognitive activities, to develop logical thinking and spatial imagination.

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