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Use of graphic computer programs in the study of engineering graphics

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Abstract. The paper is devoted to study of processes occurring in a higher school, in the field of graduates’ graphics studies. We consider the necessity of graphical package knowledge and achieving confident user skills for computer programs. We make an attempt to tackle a debatable problem on students acquiring computer-aided drafting skills. The increase of necessity for graphic packages study by the students of all specialties is justified. The paper demonstrates the findings of comparative analysis of different methods of teaching graphics in a higher school. The influence and possibilities of technologies in education was examined through theoretical material in lecture course and practical studies.

1. Introduction
Availability of microprocessor engineering and appearance of graphics editors, such as AutoCAD, Kompas Graphic etc., have stipulated the appearance of courses “Computer graphics”, “Engineering and computer graphics” in educational schedules. Alongside with two graphics study programs for courses “Descriptive geometry” and “Engineering graphics”, which appeared earlier, the indicated academic subjects became a very serious addition, qualitatively changing the concept of teaching the subjects considered in the paper.

2. Discussion
At this point there exist two approaches for presentation methods of engineering course sections, two approaches to teaching graphics. The first one is a traditional sequence of learning from descriptive geometry to engineering graphics and up to computer graphics. The second one includes learning of first two sections at once, which is carried out with usage of computing tools.

In the paper we carried out comparative analysis of both approaches and gave methodical guidelines on adding elements of computer-aided design to each of the approaches. The transition to learning engineering graphics should be organized through teaching students all capabilities of one of the graphics editors. It will facilitate students’ work with such engineering graphics tools as line types, font types, identification codes of materials on cuts and sections, etc. It seems to be reasonable to deal with all these issues during classroom sessions using computers, as any computer program realizing graphic constructions, contains built-in primitive libraries necessary for computer-aided drafting. In this case the task of the teacher is reduced to an explanation of standard requirements of their usage. An important methodical question arises on this matter: Should a student, and to what extent, have the skill of constructing the above-mentioned graphic primitives on paper? On this issue, there are two mutually opposite opinions.
Those who support the idea that students, while studying, should master their skills of constructing graphs on paper, do not take into account the fact that in most general education schools the subject of “Drawing” does not exist even as an elective. Thus, it means that students should be taught drawing skills “from scratch” as secondary school did not give enough knowledge in this field according to new educational programs. There is no time for this in the university curricula. This flaw in the programs of secondary educational institutions is also a psychological barrier for the first-year students of a university. The teaching of graphic construction skills occurs simultaneously with the study of a complex subject - descriptive geometry. The representation of three-dimensional objects on a flat diagram for many first-year students who do not know the basics of projection drawing is an incomprehensible set of graphic primitives.

Apparently, one should not expect a return to the curricula of the Soviet secondary school. On the contrary, the requirements for higher school graduate competencies tend only to tighten [1]. We suppose that the only way out of these two mutually contradictory circumstances is the strengthening of the methodological component in training using technical means of training. The latter makes it possible using the projecting technique to increase the percentage of students learning the lecture material and to make the teacher's work more effective during the hours of practical training.

The need to develop the skills of a student in the graphic construction of the image of parts is associated with sketching - an essential step in any design work. It would also be methodically incorrect to remove such training from the training process. A sketch, as well as a drawing, is a certain abstraction of an image of a real object using a number of conventions. A student can learn this faster and better with the teacher's help. In addition, when sketching there is the possibility of working out a number of questions on compliance with the requirements of the standards. To do the task without any help, students should know the types of lines, sections and cuts and be able to perform pencil sketches of all parts of the assembly.

Preparation of sketch details should be done simultaneously through graphic editor, so that a student could approach the process of designing a component assembly as a confident user of one of the programs. The task of designing a sketch of a component assembly shouldn't include more than 4 or 5 details, half of which can be of simple axially symmetric shape. It is unsuitable to give a basic part as a task for designing for technical specialties students. Thorough discussion of size analysis problems is also considered excessive. It's enough to detect the geometry of the detail, observing the only rule that the dimension chains are not closed in the drawings.

In conditions of constantly decreasing time for classroom studies it’s appropriate to take into consideration another set of questions. The following ones are the most argumentative. Is the requirement of acquisition of computer construction skills for students of technological specialties can be considered reasonable? Is it possible to be limited only to classroom work hours on computer? These questions and many others should be solved in different ways every time. Everything that was suggested for discussion in this paper is related only to teaching students of specialties, which don't include separate courses of “Computer graphics” and “Engineering and computer graphics”. Studying process for students of mechanical specialties or specialties connected with information technologies can be more significant.

The necessity of forming a united informational educational system in higher educational institutions gives a special significance to teaching students computer design of graphic objects. In this environment, as is well known, in addition to the quality indicators of a student’s progress, all the works done for the entire period of study should be presented. It is understood that these will be not only text documents, but graphic works of course design in technical or even special subjects. And without graphic package it’s impossible to prepare for fulfillment of obligatory requirement – posting graduate qualification work on university’s website.

3. Conclusion
It is especially necessary to note that learning to work with any graphics package is not a goal in itself. A computer with its program is only a tool, even though it seems very advanced in comparison to
drawing accessories, but after all it is only a tool. For a student who is going to be an expert in the future it is necessary to know the creation technology of designer documentation and to know about possibilities of the graphics editors. Conclusions:

- learning and usage of graphics computer programs in the educational process is an unconditional necessity;
- possibilities of these programs allow us to make presentation of a theoretical material more accessible for understanding;
- in the educational process the acquisition of skills of details construction for technical sketches by students should be saved.

References
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