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GRAPHIC TRAINING PECULIARITIES OF FUTURE MECHANICAL ENGINEERS ON THE BASIS OF COMPUTER ORIENTED TECHNOLOGIES

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The paper substantiates theoretical and methodological principles of the use of computer graphics technology aimed at training future mechanical engineers. As one of the areas of computer-oriented technologies we propose video technologies in information and education university environments that promote effective organization of independent graphic work of students. The use of video technologies helps to create virtual imitation models for developing spatial thinking of students, and for conducting video lectures and video tutorials to explain the way of solving the basic image and graphic constructions and tasks.

Keywords: graphic training, mechanical engineers, computer-oriented technology, video technology.

Statement of the problem. The problem of transition to new technologies requires modern techniques of teaching graphic literacy, which focus on computer graphics techniques as a new instrument of creating drawings and design. In modern manufacturing drawings have a special role as carriers of technical information, and their creation is paid special attention due to the quality requirements, realization of communicative and gnostic possibilities of graphical representations. Today in the learning process such powerful graphic programs as Corel DRAW, AutoCAD, "Compass" and others, which provide high speed and quality of graphic information creation and processing, gained distribution. The process of society informatization is an objective phenomenon connected with an increase in the role and impact of intellectual activities in all areas of production. Therefore, the study of the problems of computer-

oriented technologies development and implementation in the training of future engineering direction specialists remains relevant and timely.

The purpose of the article: on the basis of the analysis of modern professional activity of an engineer to investigate the possibilities of computer-oriented technologies as a means of a specialist's graphic competence formation and to reveal methodical ways of their implementation.

Analysis of recent sources. Conceptual, content and technical aspects of improvement of graphic knowledge, skills and abilities formation process at schools, technical schools, colleges were investigated by O.Botvinnikov, V.Vassylenko, V.Vasenko, H.Havryschak, V.Herver, P.Dmytrenko, V.Zhukov, V.Kachnyev, O.Kabanova-Meller, N.Sevastopolskyy, V.Sydorenko, V.Troshyn, V.Chepok, Z.Shapoval et al.

Scientific works of the following scientists were devoted to the problem of graphic knowledge and skills formation of students in higher educational institutions: A.Verhola (didactic basics of graphical literacy teaching process optimization); V.Burynskyy (self-study as a means of graphic training improvement); V.Vitrenko (graphic training content of labor education teachers); Y.Hushuley (spatial image formation on the basis of graphical representation); O.Glazunova, A.Korneyeva, V.Tkachenko, M.Yusupova (methods of computer graphics use) and others.

However, a special contribution to the formation of graphic training of pupils and university students belongs to a prominent Ukrainian scientist and founder of the graphic school in Ukraine, Corresponding Member of the Academy of Pedagogical Sciences of Ukraine, Doctor of Pedagogical Sciences, Professor **Victor Kostyantynovych Sydorenko**.

Considering the integration of labor studies and drawing as a means of students' technical abilities development, V.Sydorenko developed an integrated didactic training system which has two levels: psychological and didactic. System creating element on a psychological level is spatial thinking in interconnection with scientific and technical support, which is the basis of creative technical activity. On the didactic level system creating elements are the integration processes aimed at interdisciplinary connections

implementation of labor studies and drawing, ensuring the integrity of general technical knowledge and skills, and motivational aspects of graphic knowledge and skills implementation in the course of solving technical problems. In conditions of subjects' integration, according to V.Sydorenko, the integrity of technical thinking development is ensured, graphic knowledge and skills are filled with technical subject activities, an active transfer of graphical knowledge and skills in technical training activities takes place. Conceptual principles of graphic training developed by V.Sydorenko remain relevant today. Exactly on these concepts modern scientific schools of graphic direction, headed by his students and followers, including O.Dzhedzhula, D.Kelderov, M.Kozyar, H.Raykovska, R.Chepok etc, are based.

However, the problem of graphics training of students at higher educational institutions is complex and multilateral. Psychological and pedagogical aspects of students' spatial thinking formation, modern technologies of graphic information procession and possibilities for creating virtual spatial objects require purposeful scientific research. One of the priority directions is research of opportunities and development on this basis of multimedia technologies of mechanical engineers' graphical competence formation. The use of multimedia means in the system of education demonstrates a new phase of cooperation and development of scientific and pedagogical creative work and the process of applying its results.

The main material. The introduction of modern information and communication technologies in the national doctrine of education development is considered to be a priority direction. Computer technologies today include multimedia lectures, interactive practical works and programs, programs-tests, electronic directories, textbooks, computer games, professional applications software. These technologies are changing efficiency, availability, speed of knowledge acquisition, promote students' initiativeness by providing preparation of the younger generation to life in the information society.

Principles of multimedia technologies are characterized by acts of momentary visual and procedural perception, synthesis and synchronization of verbalized and not verbalized knowledge that promotes analytical and synthetic activities of the student and simultaneous synchronization of not verbalized and verbalized knowledge,

synchronization and integration of visual and spatial information, which is the basis of graphic engineering activity. The use of multimedia technology in graphic training contributes to the development of creative and intellectual potential of future mechanical engineers [1,3]. Multimedia systems allow you to choose the necessary format of educational material beforehand, and standards of modern media allow not only to save a large amount of diverse information (up to tens of Gb), which is extremely important for provision of educational process mobility and significantly improve its quality.

In the application of multimedia technology in graphic training we offer two directions: 1) working with simulation models and object-oriented environments; 2) the development and use of video technologies to solve basic graphics problems and formation of graphic construction skills. The first direction involves the creation by a teacher of a preliminary model and working out problem tasks for finding the optimal variant of the solution.

A student's activity requires careful perception and comprehension of a problem, planning steps for solving the problem and reproduces the course of the model study and presentation of research results. While the role of the teacher can be quite passive and stages of research are directed by leading questions. If the student has insufficient skills in self-study, multimedia means with appropriate methodological support provides him with the necessary help. In this case there is a student – multimedia collaboration: a student independently masters an educational material, but at any time can get direct instruction, context advice or recommendation of the computer software assistance system or a teacher [2].

Considering the organizational aspect of multimedia technology application in graphics training, university educational environment possibilities for methodical wok of teachers should be taken into account.

Thus, teachers of Vinnytsia National Agrarian University use unique opportunities of information systems "Socrates" for the introduction of information technologies in the educational process. To create didactic videos a "teacher's office" is used, which has a set of tools for creating and storing video data (Fig. 1).
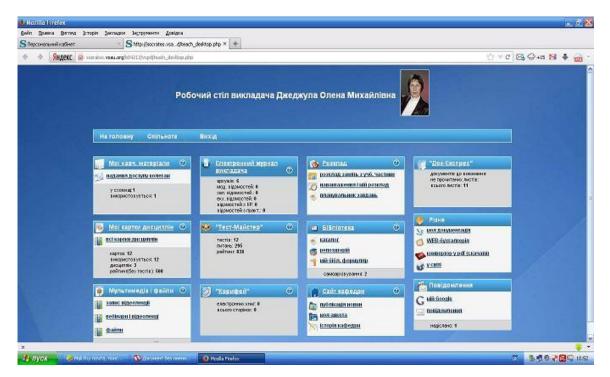
Fig.1 Functional possibilities of a "teacher's office" for multimedia technologies development

After analyzing the best practices of scholars in the field, we came to the conclusion that in conditions of low number of practical classes for studying graphic disciplines at a higher educational institution of agrarian profile and interest of students in the use of new information technologies in the study of descriptive geometry, engineering and computer graphics, it is appropriate to offer a graphical competence formation technique, which would include traditional methods of graphic training combined with new information and communication technologies which can release a teacher from routine work and provide students with relevant original tasks and information that fully meet their specialization [6].

This technique, which meets all the requirements of modern professional education, is possible today on condition of creation and use of technological learning environment based on the higher educational institutions of Ukraine.

Among modern information technologies special place is occupied by video technologies, among which clip technologies are being distinguished now.

As an information and methodical means video technologies perform a variety of functions. By means of video technology a video archive of lectures and master classes

of VNAU leading teachers, which are stored in the information environment "Socrates" and are available at any time for students, is created.

In developing of video technologies we focus, first of all, on the individual work of students. One of the goals in the development of video technologies is creating video courses (Fig. 2).

Fig. 2. Video fragment on the subject "Engineering Graphics"

In developing training videos, special attention should be paid to the diligence of information selection in terms of its usefulness to students and multiplicity. Indeed, as our observations show, the most effective duration of a video is 5-15 minutes. We call it the active phase of the student's work.

Created instructional videos are available to students at any time via the Internet.

Conclusions. Informatization of education requires extensive use of new technologies in the learning process. Thus there is not only a change in ways of presenting information, but also a significant effect on the organization of classes, the system of methodological support, workplace organization of a teacher and a student. In this regard, the educational process gains new, previously unknown characteristics. Among them availability, mobility, new types of communication of educational process participants can be distinguished.

The main trend in graphic training informatization is connected with the use of multimedia technologies, which are effectively realized in modern information educational university environments.

The video technologies as a component of integral computer-oriented technologies allow to organize as classroom work, under the guidance of a teacher, as an independent graphic training of future mechanical engineers on a new level through the use of simulation models for visualization and graphic models transformation and implementation of methodological support of a new generation (video lectures, video tutorials to solve basic graphic tasks and to form skills of practical graphic work).

Prospects for further research are connected with the research of innovative methodological support in developed countries of the world, the exchange of experience with professors from leading universities of Ukraine and, on this basis, the rationale of didactic conditions of video technologies implementation and improvement in the process of students' graphic training.

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