

## USING MULTIMEDIA TECHNOLOGIES IN TRAINING “DESCRIPTIVE GEOMETRY AND ENGINEERING GRAPHICS”

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**Abstract.** *The article discusses the issues of teaching descriptive geometry and engineering graphics at higher technical educational institutions, increasing the motivation of students to obtain the necessary competencies that allow them to competently execute drawings. The article provides the main methods of conducting classes in the discipline “Descriptive Geometry and Engineering Graphics” for students of technical education. To conduct lectures and practical classes at the Department of Engineering and Computer Graphics, multimedia courses with animation elements have been developed, educational presentations that reveal the specifics of the discipline, and the features of the educational process at Tashkent State Technical University have been taken into account. The use of multimedia developments allows you to simulate solutions to a given problem. Students develop an algorithmic style of thinking, develop the ability to think optimally and act variably. The use of multimedia developments at the department of descriptive geometry and computer graphics showed an increase in academic performance compared to previous years of classes without presentation. This indicates that the use of multimedia lectures and practical exercises makes it possible to increase the efficiency and quality of learning, and also provides an opportunity to better explain the educational material to students.*

**Keywords:** *traditional methods, independent study, learning efficiency, interactive technologies, descriptive geometry and engineering graphics, reading drawings, performing graphic work, spatial object, educational process, multimedia technology, adaptation of first-year students, motivation to learn.*

In modern conditions, high requirements are placed on the level of professional training of competitive specialists. Graphic literacy is one of the main components of training future engineers. The requirements for the quality of students' graphic training make it necessary to find ways to improve teaching methods.

Until recently, only traditional teaching methods were used to explain the learning material: laboratory posters, practical drawings and hand-drawn explanations on the blackboard. This approach does not allow to present the studied topic in sufficient volume due to time constraints. Some questions are asked for independent study, therefore the effectiveness of teaching decreased, a new level of quality was needed in teaching methods. According to the State Educational Standards of Higher Professional Education, this predetermined the transition to the use of traditional teaching methods to the active use of interactive technologies in the educational process, which meets the latest complex goals and tasks for graphic subjects.

The subject "Engineering and computer graphics" is considered one of the first important subjects in the formation of graphic engineering skills of a future bachelor studying "unique techniques and technologies" in the field of technical education at Tashkent State Technical

University. As a result of studying "Engineering and computer graphics", a student should have complete knowledge of the properties of the basic laws of intersection of geometric shapes and surfaces of geometric models, necessary for reading and making assembly drawings of machine mechanisms, details, parts, and drawing up design documents [1]. The ability to solve metric and situational problems, to perform drawings, to perceive based on graphic models, to implement one's knowledge and skills in the form of drawings of specific spatial objects - this is the creation of new machine mechanisms and the preparation of their design documents, their application to production.

Successful mastering of engineering and computer graphics in the first academic semester of the university helps to learn other graphics subjects more easily. A first-year student faces complex problems in mastering the skills necessary to perform and read geometric elements, surfaces, machine details, drawings, and create project documents.

In order to overcome the weak level of graphics education of students, the system of adaptive information for the successful development of this subject was introduced in the department of engineering and computer graphics of Tashkent State Technical University. The fact that first-year students do not have the skills and qualifications to perform graphic work can be eliminated in a short time, which will give the department teachers a lot of time to perform the main task before them.

Engineering is very important for the development of specialists in this field, which was founded by the teacher of graphics: a first-year student should learn to solve metric problems, the optimal dimensions of its elements based on graphic models, and to visualize in general. The acquired knowledge and skills should be applied in practice in the form of detailed drawings of special spatial geometric bodies for later application in educational and production activities.

In order to successfully involve students in the learning process and education and to accelerate the learning process, it is necessary not only to give certain knowledge, but to analyze them, it is necessary to use step-by-step interactive teaching methods [3]. The use of multimedia technologies in the form of presentations and educational topics planned on the screens installed in the auditoriums of engineering and computer graphics helps students to acquire the necessary competences in a short time from the first topic to perform drawings in high quality [3].

Multimedia courses with animation elements have been developed on all topics for lectures and practical training for students of the Faculty of Mechanical Engineering. Special features of "Engineering and computer graphics" are taken into account in educational animations. The presence of this element of the educational process is very important for the development of visual thinking of students within the framework of the academic subject and its general demand.

Active acquisition of visual material can be achieved only when the topics of the training course are clearly explained with the help of images. Most of the time, the traditional method of teaching an engineering course, teachers drawing on the blackboard, students are not always able to successfully accept these ideas. Any information about a topic or event in such a complex academic discipline cannot be directly communicated to the student unless the topic or event is presented in a well-planned manner. The teacher should help the understanding not only through the descriptions or drawings that describe the subject, but also through the structure of the drawing. Later, any information obtained in this way will be able to divide the knowledge into separate groups, which will form a new stage of visual-logical thinking for students of the first stage. Active perception of such educational information requires special organization, deep ways of presenting

educational material [4]. The simplest and most logical form of implementation of the above is visualization of educational material using multimedia training courses.

Therefore, in the presentation of theoretical material, the teacher takes the form of a detailed explanation of the attached animated slide films. All slide films provide complete visual information about the topic of the thematic discussion, reveal the main approaches to the subject information. For example, in the lecture "Surface formation", the classification of surfaces is given, the dynamics of surface formation is shown with the help of animation, and different methods of surface formation are compared. All materials are illustrated with visual images. The slides show step-by-step construction of conoid, cylindroid and hyperbolic paraboloid in orthogonal and axonometric projections.

In the topic lecture "Intersection of geometric bodies with a plane" the intersection of various geometric bodies with a plane is clearly shown. At any time, the demonstration on the topic of the intersection of a geometric surface with a plane can be stopped, and it will be possible to repeat the demonstration at the request of students.

Visual (by seeing) perception at this stage is the main element of students' immersion in the subject related to the impact process of this process: visual perception is a process that simultaneously combines two important components of the process of remembering. Visualization, together with theoretical and oral presentation, enriches intellectual property for students, determining the importance of developing multimedia courses, especially in complex spatial topics such as "engineering and computer graphics".

Another important factor in the development of students' thinking, in which representation in the form of multimedia content plays a key role, is the development of analytical skills in the projection plane. After all, the goal of teaching students is not only the opportunity to acquire sufficient knowledge of drawing geometry and engineering graphics, but also the ability to apply the acquired knowledge in various situations. Lessons should be organized in such a way that students can be forced to analyze, compare and draw conclusions on solving the task.

The presence of various analytical tasks during the course, along with the measurement of spatial visualization and theoretical knowledge, the complementary educational material helps to combine different methods of mastering as effectively as possible. At the same time, the analytical tasks to be solved within the practical training, the content of the acquired knowledge about the theory and its spatial expression, are determined with the development of the theory, but also as the main means of assessing the level of mastery of the students of the course.

Various analytical tasks and approaches to solving them also play a big role in this. Thus, the students of the technical direction, mechanical engineering faculty were invited to perform the graphic work of "cut detail". The cut is made with straight cuts. Students should make orthogonal and axonometric projections of a sectional detail. In the topic "Intersection of the surfaces of a geometric body", it is necessary not only to correctly perform the task of finding the intersection line of geometric bodies, but also to analyze the methods of constructing the intersection line, the method of auxiliary cutting planes or the method of auxiliary spheres, to see which of them is simpler and more convenient [2].

A comparison of the results of these types of tasks shows that students perform task tasks with multimedia elements one and a half times more effectively. In this situation, the time to perform the tasks and their correct performance are the efficiency criteria.

At the same time, another criterion of effective mastering is ensuring the fulfillment of tasks: the tasks offered to students for solving should have a practical orientation. The content of multimedia topics should be covered not only with examples illustrating the theory, but also with various practical examples. Starting with the topics "Projection of a point", "Projection of a straight line", students will determine issues such as determining the geometric element point, the projection of a straight line, their mutual location, the angles of deviation relative to the planes of the projections and their lengths. In the study of the "plane" topic, the problems of determining the true size of the distance from a point to a plane are studied.

As a separate topic, the skills of visual thinking are counted and it is combined with the skills of analyzing spatial situations. The main role is played here by the students' independent calculation-graphic work. All calculation-graphic works performed in the course of studying "Engineering and computer graphics" also have a practical orientation.

The use of multimedia developments helps students to analyze and compare solutions to problems. Students develop an algorithmic way of thinking, the ability to think optimally and choose the right option is formed.

Lectures on the use of multimedia developments in the Department of "Engineering and Computer Graphics" showed that the mastery rates increased by several percent compared to previous lecture years without presentations.

A survey of students after the academic semester showed that a very high level of mastery was achieved due to the use of multimedia technologies in the educational process. Most of the students answered that the teacher fully explains the educational material, and they consider the content and quality of the presentation slides to be good, and they rate their knowledge highly.

It is the creation of a database for lectures and practical exercises that will help to improve the efficiency and quality of the educational process at the Department of Engineering and Computer Graphics of Tashkent State Technical University.

The joint use of all the above-mentioned methods is the most important task of the educational activity of pedagogues, which allows to prepare educated students and become mature specialists in their field.

Summary. The use of multimedia lectures and practical classes allows to increase the efficiency and quality of teaching, as well as to explain the educational material to students in a wider volume, to increase the interest of students in the subject being studied, and to deeply understand the nature of the phenomena and processes being studied.

The use of visual (vision) technologies is aimed at the full and active use of students' natural abilities due to the intellectual possibility of presenting educational material. The combination of visual, textual and oral information helps the student to use computer capabilities with ease of obtaining information and leads to the creation of a holistic image of science based on a combination of different types of perception.

The use of multimedia developments in the drawing geometry and computer graphics department showed that the results of mastering indicators increased by several percent compared to the previous school years without presentations.

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