

**NEW INNOVATIVE TECHNOLOGIES IN THE TEACHING OF THE
SUBJECTS" DRAWING GEOMETRY "AND" ENGINEERING
GRAPHICS"**

*Rakhimov Anvar Makhmudovich, senior lecturer,
Tashkent State Technical University
named after Islam Karimov*

*Tairova Nafisa Sabirdjanovna, assistant
Tashkent State Technical University
named after Islam Karimov*

Annotation: To implement the requirements of the basic educational programs in the disciplines "Descriptive geometry" and "Engineering graphics", the analysis of the low academic performance of students that has developed in recent years has been carried out and modern auxiliary methods have been proposed to increase the level of mastering of these disciplines by students. As a result of the analysis of the low academic performance of students in these disciplines, external and internal reasons were identified. The main external reasons include: adaptation of freshmen to new learning conditions; lack of an initial base for descriptive geometry and drafting. The main internal reasons include: reducing the classroom load; change in the form of final certification. Of the listed reasons for improving the quality of education, it becomes necessary to adapt teachers to new working conditions, which entails a revision of teaching methods and technologies. In order to increase the level of mastering by students of the disciplines "Descriptive Geometry" and "Engineering Graphics" and to save study time, it is necessary to introduce interactive methods into the learning process. New technologies help to shape spatial thinking, develop and shape students' professional competencies. For the implementation of interactive methods, various tools are used as software, which allow the creation of auxiliary teaching materials. Based on the fact that there are

various types of work with students, this work proposes a classification of tools for creating educational materials or implementing interactive methods. In this case, tools are software that which allows you to create training videomaterials etc. The created material is animated videos with a detailed explanation of the construction of tasks, video lectures, test tasks. This paper proposes a methodology for creating auxiliary teaching material. The purpose of these training materials is, firstly, invaluable assistance to the student, aimed at the development of spatial thinking, the formation of basic theoretical concepts and methods of constructing drawings; secondly, saving time of the educational process. Invaluable assistance to the student, aimed at the development of spatial thinking, the formation of basic theoretical concepts and methods of constructing drawings; secondly, saving time of the educational process. invaluable assistance to the student, aimed at the development of spatial thinking, the formation of basic theoretical concepts and methods of constructing drawings; secondly, saving time of the educational process.

Key words: descriptive geometry, engineering graphics, innovative technologies in teaching, interactive methods, animation.

**НОВЫЕ ИННОВАЦИОННЫЕ ТЕХНОЛОГИИ В ПРЕПОДАВАНИИ
ДИСЦИПЛИН "НАЧЕРТАТЕЛЬНАЯ ГЕОМЕТРИЯ" И
"ИНЖЕНЕРНАЯ ГРАФИКА"**

*Рахимов Анвар Махмудович, старший преподаватель,
Ташкентский государственный технический университет
имени Ислама Каримова*
*Таирова Нафиса Сабирджановна, ассистент
Ташкентский государственный технический университет
имени Ислама Каримова*

Аннотация: Для реализации требований основных образовательных программ по дисциплинам «Начертательная геометрия» и «Инженерная графика» выполнен анализ сложившейся в последние годы низкой успеваемости студентов и предложены современные вспомогательные методы

для повышения уровня усвоения студентами данных дисциплин. В результате проделанного анализа низкой успеваемости студентов по данным дисциплинам выявлены внешние и внутренние причины. К основным внешним причинам относятся: адаптация первокурсников к новым условиям обучения; отсутствие первоначальной базы по начертательной геометрии и черчению. К основным внутренним причинам относятся: снижение аудиторной нагрузки; изменение формы итоговой аттестации. Из перечисленных причин для повышения качества обучения возникает необходимость адаптации преподавателей к новым условиям труда, что влечёт за собой пересмотрение методов и технологий преподавания. С целью повышения уровня усвоения студентами дисциплин «Начертательная геометрия» и «Инженерная графика» и экономии учебного времени в процесс обучения необходимо ввести интерактивные методы. Новые технологии помогают формировать пространственное мышление, развивать и формировать профессиональные компетенции студентов. Для реализации интерактивных методов используются различные инструменты в качестве программного обеспечения, которые позволяют создавать вспомогательные обучающие материалы. Исходя из того, что существуют различные виды работ со студентами, в данной работе предлагается классификация инструментов для создания учебных материалов или реализации интерактивных методов. В данном случае к инструментам относятся программное обеспечение, которое позволяет создавать обучающие ролики, видеоматериалы и т.д. Созданный материал представляет собой анимированные ролики с подробным объяснением построения задач, видеолекции, тестовые задания. В данной работе предлагается методика создания вспомогательного обучающего материала. Целью данных обучающих материалов является, во-первых, неоценимая помощь студенту, направленная на развитие пространственного мышления, формирование основных теоретических понятий и способов построения чертежей; во-вторых, экономия времени учебного процесса.

Ключевые слова: начертательная геометрия, инженерная графика, инновационные технологии в обучении, интерактивные методы, анимации.

Analysis of progress in the disciplines "Descriptive Geometry" and "Engineering Graphics" shows a low level of assimilation of these subjects. Difficulties in mastering these disciplines are caused by the following reasons:

- starting university courses in physics, chemistry, mathematics and other disciplines, the student already has a certain base, but when studying descriptive geometry there is no such base, because it is not closely related to the disciplines taught in high school. Although certain provisions from the school stereometry course are used in it. But unlike stereometry, which studies concrete bodies, in descriptive geometry, abstract points, straight lines, planes are first considered, which requires a lot of attention, concentration and spatial thinking. And these qualities in yesterday's schoolchildren are very poorly developed;

- the study of "Descriptive Geometry" and "Engineering Graphics" begins from the first semester, when students are just beginning to adapt to new conditions of life, to a new environment, etc. (This is especially true for nonresident and foreign students). At the same time, the usual school lessons were replaced by completely new types of activities - lectures and practices. Simultaneous listening and taking notes of lectures is also difficult. Doing home practical assignments requires the ability to plan and organize your independent work;

- the lack of graphic training among freshmen, both the skills of using drawing tools and basic knowledge of the drawing course, greatly inhibits the learning process.

The named reasons are external, which the teacher cannot influence. There are also internal reasons for poor academic performance:

- existing time standards for both classroom work and for monitoring independent work. According to the existing time norms, 1 academic hour is allocated for independent work of students (IWS) to work with students. In the semester, the student completes 3 home graphics assignments, i.e. for consultation, verification and acceptance of one assignment - 15 min. In fact, the situation is as follows: 3-5 weeks are allotted for each task, during which the student consults 2-3 times, then the teacher checks the completed task, and only then his defense will take place. At the same time, more time is spent than planned, at least an hour per student

per semester. In addition to the teaching load, the teacher must conduct other types of work provided for by the individual plan. Thus, if you adhere to the established norms, work with a student is formal, which inevitably leads to a decrease in academic performance; if you devote sufficient time to IWS, then the implementation of the individual plan leads to a significant excess of the total teacher load (1460 hours);

- with regard to classroom work, a total of 28 hours in 1 semester are allocated for practical training. During this time, teachers must manage to eliminate the gaps in school drawing, teach how to use drawing tools and teach abstract thinking. At the same time, the teacher must still have time to complete the schedule for descriptive geometry. It is not yet taken into account that the group consists of students with different backgrounds, there are students who have poor knowledge of the Russian language (foreign students), there are students who find this subject very difficult for them. All of these factors lead to a decline in academic performance;

- motivation is one of the leading factors in successful learning. Unlike senior students, the motivation of freshmen is associated with the assessment of their performance, i.e. the labor expended is proportional to the type of final certification (test or exam). Traditionally, the study of descriptive geometry ended with an exam. Now the exam has been replaced by a test or, at best, a differentiated test. To get credit, you can get the minimum number of points per semester, while the quality of the work is not talking.

It follows from the above that in order to improve the quality of education, it is necessary to revise the organization of the educational process, taking into account the reduced classroom load and the specifics of disciplines, and also to increase the level of final certification.

From the listed reasons, it is also necessary to adapt teachers to new working conditions. To this end, it is necessary to introduce new technologies for teaching students. One of the types of such technologies is the development of various interactive, animated materials. In work [1], the author proposes to use modern educational technologies, in particular, interactive teaching methods in organizing the process of teaching bachelors. The technologies presented in the system of higher

professional education when implemented within the framework of the educational program, various personality-activity, personality-oriented pedagogical technologies are opposed to traditional ones and are innovative [2-5].

Based on the fact that there are various types of work with students (lectures, practical exercises, checking theoretical material), the following classification of tools for creating educational materials or implementing interactive methods can be considered. In this case, tools include software that allows you to create educational animated videos, videos, etc. This classification is as follows:

1. Programs for creating animated videos. These videos help students to master construction methods, they are also demonstration material for preparing for practical classes and performing home computational and graphic works.
2. Programs for mounting video lectures, for recording video from the monitor screen while executing drawings with a detailed explanation of each stage of construction.
3. Programs for monitoring students' theoretical knowledge, i.e. programs for creating test items.

There are a lot of programs for creating animated courses, from complex ones with programming elements to easy-to-use ones. Among the complex programs, one can single out the Macromedia Flash program. To create videos in Flash, you need to have working skills. The main disadvantages of creating educational materials for the disciplines "Descriptive Geometry" and "Engineering Graphics" in the Macromedia Flash program include labor intensity and the lack of the ability to create drawings. The advantage of videos created by this program is that the created material is more colorful and has more "live" animation. Adobe Flash allows you to work with vector, raster and three-dimensional graphics [6]. Animation in Flash is based on vector morphing, that is, a smooth "flow" from one keyframe to another. This allows you to create complex cartoon scenes with just a few keyframes. When creating animations for the purpose of learning, all the capabilities of Flash are not fully exploited, therefore, it is better to use a program that is easier to use.

From user programs, you can consider Easy Gif animator. The advantage of this program is its ease of use. The disadvantage is the lack of programmability. The

essence of creating materials using these programs is to prepare each individual frame. Since the material is created according to engineering graphics, each frame is also a drawing. And to create a drawing, you need to turn to specialized programs for building drawings, for example, Kompas 3D, AutoCAD. Perhaps, in the Flash program, you can create very simple drawings, for example, sketches, but it must be borne in mind that even a simple drawing must be made according to the USDD standards (Unified system for design documentation), for example, the projection connection, line thickness requirements, etc. must be observed.

Let's consider an example of creating an animated video created in the Easy Gif animator program. One of the difficult topics in descriptive geometry for students is the construction of lines of intersection of surfaces. Below is a technique for creating a video. In this video, an example of constructing a line of intersection of surfaces by the method of concentric spheres is considered. To obtain this video, you must first prepare drawings with a step-by-step construction of the intersection line, as shown in Figures 1 - 3. For a more understandable construction, you can prepare a larger number of frames. Here are 6 frames, which show the construction of the line of intersection of two cylinders by the method of concentric spheres. Each frame can be accompanied by comments explaining each stage of construction.

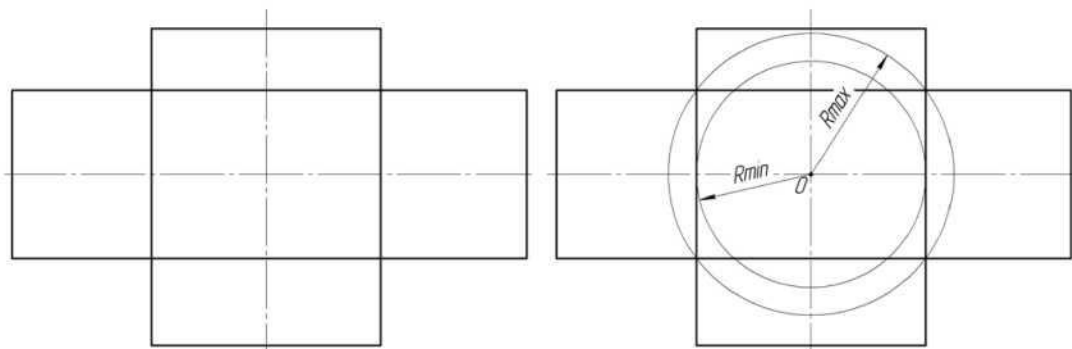


Figure 1. First and second frames

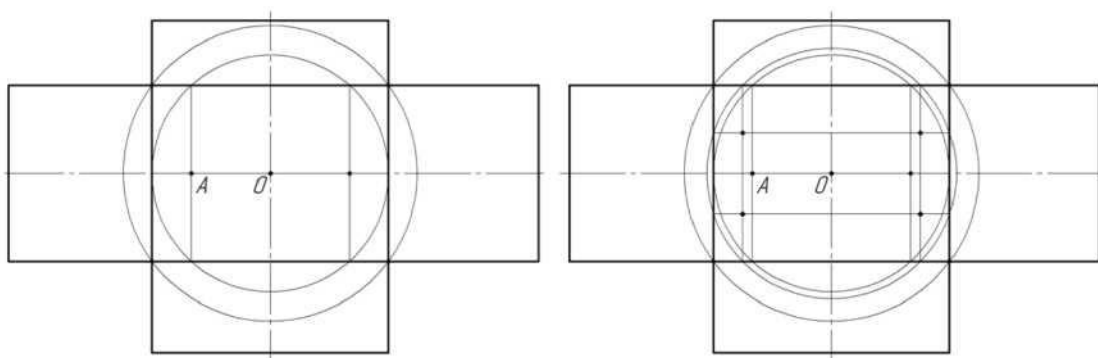


Figure 2. Third and fourth frames

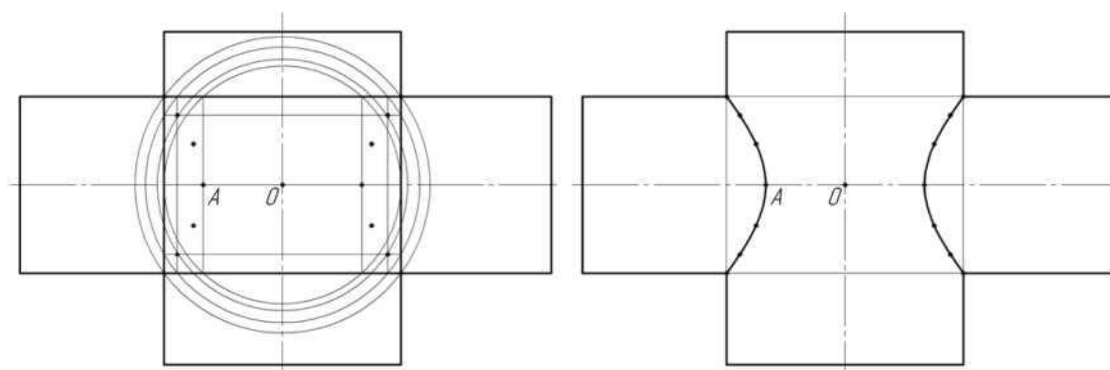


Figure 3. Fifth and sixth frames

After preparing pictures or frames, you need to load them into the program and set the display time for each frame. Then the file is saved in Gif format. This file can be run using any browser. The advantage of these animated videos is that a student with the help of these materials can at any time remember, consolidate the basic algorithms and methods of construction. The biggest advantage of the created animated videos is the sequence of constructing the task to be performed, and this contributes to the activation of the process of understanding and assimilating complex educational material. These animated videos can be created for each topic and handed out to students as teaching aids. The creation of these materials takes a minimum of time for the teacher, mostly time is spent on the preparation of each frame. Gif animations are not always convenient to use, i.e. open with a browser, in this case it is more convenient to use programs that have more capabilities, for example, create files with the avi extension. Files with this extension can be opened on almost any computer and are convenient because the created videos can be paused at any time. Such programs include the Movavi program. It is designed to mount video, record video from a monitor screen, is easy to use and has many options. that the created videos can be paused at any time. Such programs include the Movavi program. It is designed to mount video, record video from a monitor screen, is easy to use and has many options. that the created videos can be paused at any time. Such programs include the Movavi program. It is designed to mount video, record video from a monitor screen, is easy to use and has many options.

Video editing software is needed if an unsuccessful frame is found, when you need to remove the beginning and end of the video, insert subtitles, the title of the

lecture, etc.

They are widely used in teaching methods of programs for recording video from a monitor screen. For example, you need to complete and explain to students the construction of a complex drawing. To do this, you can use drawing programs and record the entire drawing process on a video with an explanation of all the stages of construction. At the same time, the student learns the basics of working in programs for making drawings - Kompas 3D, AutoCAD.

Various test items are used for quick control of theoretical material. There are special programs for creating test items. For example, the MyTest program is a system of programs - a student testing program, a test editor and a results journal - for creating and conducting computer testing, collecting and analyzing results, and giving marks according to the scale indicated in the test. This system has the ability to create all types of tests [7]:

- 1) closed type - multiple-choice;
- 2) open type - with the introduction of the answer;
- 3) compliance test;
- 4) test to indicate the correct sequence.

Test control is widely used [8] in the study of various disciplines of higher education. Disciplines "Descriptive geometry" and "Engineering graphics" are no exception, because without knowledge of theoretical material and basic methods of construction, the student has poor understanding and spatial thinking for the implementation of drawings.

Output

This paper analyzes the reasons for the poor performance of students in descriptive geometry and engineering graphics. Identified as external reasons, which the teacher cannot influence, and internal, associated with the new prevailing norms of time. Tools as software and a methodology for creating auxiliary interactive teaching materials are proposed.

In connection with the decrease in the classroom load, the teaching material helps students to develop and form spatial thinking, professional knowledge, skills in descriptive geometry and engineering graphics.

Список литературы

1. Соловьева Ю.Ю. Использование матрицы Бостонской консалтинговой группы в процессе оценки недвижимости: Глобальные процессы в региональном измерении: опыт истории и современность: Сборник Междунар. науч. конф. в 2 т. – Т. 1.– Новосибирск: СГУГиТ, 2015. – С. 157-160.

2. Мигунов Д. Нефть не нужна: когда спрос на черное золото перестанет расти? //URL: <https://iz.ru/930470/dmitrii-migunov/neft-ne-nuzhna-kogda-spros-na-chnoe-zolot-operestane-trasti> (дата обращения: 20.11.2021).

3. Долгосрочное снижение спроса на нефть // URL: <https://dokhodchivo.ru/dolgosrochnoe-snizhenie-sprosa-na-neft> (дата обращения: 25.06.2020).

4. Сидорович В. Мировая энергетическая революция. Как возобновляемые источники энергии изменят наш мир. – Альпина/Публишер, 2015 г. URL: <https://www.labyrinth.ru/books/499549> (дата обращения: 20.11.2021).

5. Жизнь после нефти. <https://forumspb.com/news/news/zhizn-posle-nefti/> (дата обращения: 20.11.2021).

6. Землянская Н.Б., Казакова Н.В., Сазонов А.А. Стратегический анализ отечественного авиационного двигателестроения на основе матрицы Бостонской консалтинговой группы // Вестник университета. – 2017. - № 3. – С. 12-15.

7. Бороздина С.М. Определение стратегического продуктового портфеля строительного предприятия как элемент его конкурентоспособности // Экономика: вчера, сегодня, завтра. – 2017. – Т. 7. - № 8А. – С. 164-174.

8. Корчагова Л.А., Черемушкина Ю.Е. Особенности формирования продуктового портфеля на фармацевтическом рынке // Вестник РГГУ. Серия: Экономика, управление, право. – 2017. - № 4. – С. 61-73.