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Improving the Use and Methodology of Graphic Programs in the Teaching of Drawing Skills

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Abstract: Introduction: The article addresses the problems and shortcomings encountered in mastering the subjects of drawing and geometric drawing, and proposes overcoming them through the use of graphic programs to facilitate students' work with complex drawings. AutoCAD serves as an example of graphics software utilized in the study of these subjects.

Aim: The aim is to facilitate the mastery of drawing and geometric drawing and to enhance imagination using graphic programs with the assistance of computer technologies.

Materials and Methods: A corpus of 15 scientific articles was assembled to analyze the extent to which students can master the subject matter and technology under study, and to evaluate the influence of ease and difficulties in mastering this subject matter post-instruction. The corpus consists of 5 articles addressing problems arising from the use of modern technologies and 10 articles discussing the advantages of using graphic programs. These articles were published in international and national academic journals between 2019 and 2023. They underwent analysis and a comparative study was conducted.

Discussion and Results: The collected materials reveal the impact of using graphic symbols on learning outcomes. Scientific articles analyzing the advantages of teaching drawing with graphic programs demonstrate a higher level of engagement compared to articles focusing on the disadvantages of modern computer technology. In both cases, authors engage with the reader by referencing them and drawing upon general knowledge. However, articles related to computer graphics programs are more accessible to the reader than those focused on traditional drawing instruction, actively directing attention and directly addressing the reader through comments. Teaching drawing and geometric drawing with graphic programs using modern pedagogical technologies helped expand students' imagination and facilitated comprehensive knowledge acquisition. The primary distinction lies in direct appeals to the reader, conveyed through personal comments and questions.

Conclusion: The research results have been widely cited in scientific articles of significant pedagogical value, with most demonstrating successful implementation of 3D modeling and varying levels of accuracy compared to traditional methods. The convenience of producing clear images and the enhanced ability to visualize and imagine are shown to be of great importance in teaching drawing, geometric drawing, and mechanical engineering. This, in turn, aids in the

development and appropriate direction of global knowledge.

Keywords: drawing, AutoCAD, sketch, projection, connection, technical drawing.

The independence of the Republic of Uzbekistan opened a great path for the revival of our spiritual and historical values, as well as the traditions of folk pedagogy, and their development based on modern pedagogical and information technologies. New laws and decrees have been announced to further develop the education sector. As President Shavkat Mirziyoyev stated, “Our youth rightfully have the capacity to take on the responsibility for the future of our Motherland, and the fact that they are becoming the decisive force of today and tomorrow brings us all pride and honor. It is necessary for us to bring to a logical conclusion the large-scale work we are carrying out in this area, especially our national programs adopted in the field of education and upbringing.”

The main task of the government, the relevant ministries and agencies, and the entire education system, as well as our esteemed teachers and professors, is to provide a solid education to the younger generation, and to raise them as physically and spiritually mature individuals.[1]

Currently, there should be no subjects in higher education that do not utilize the capabilities of computer technologies. In the higher education learning process, various programs of information technologies and new pedagogical technologies have been developed for all subjects, and the pace of using computer technologies is increasing year by year. It is important to emphasize that computers are widely used in various areas of the education system, such as: computer science, chemistry, drawing, physics, biology, geography, geometry, and mathematics.

Muhandislik kompyuter grafikasi darslarida berilgan grafik chizmalarni bajarish o‘quvchilarda katta qiziqish uyg‘otish bilan birga grafik dasturlarda ishlash ko‘nikmalarini shakllantirish uchun xizmat qiladi va o‘zlashtirishni faollashtiradi.

The graphic work assigned to students is aimed at preparing teachers of technical specialists and drawing subjects in pedagogical higher education institutions. The form and content of these graphic works are selected based on the graphic representations to be completed for various fields of specialization. For example, in the field of construction and architecture, graphic works can include geometric patterns, or "girih" used in painting, as well as prepared "girih" compositions and projects of construction objects in folk applied art such as wood and clay carving. In this context, the question arises, "Why is it necessary to use the AutoCAD graphic program?" Because the AutoCAD system of Autodesk is considered the international standard for automated design today. Even though the AutoCAD program was created more than 20 years ago, it still maintains its popularity among graphic programs.[2] The AutoCAD program is a comprehensive and popular automated design software that performs various types of diagrams and drawings with high precision and quality. Additionally, it helps users fully realize their creative potential.

Currently, there are several conveniences in graphic programs for creating complex construction and mechanical drawings. Among them, the AutoCAD program is very convenient for design, allowing for high precision work based on exact measurements for both two-dimensional and three-dimensional drawings.

[1] Mirziyoyev Sh.M. Erkin va farovon, demokratik O‘zbekiston davlatini mard va olijanob xalqimiz bilan birga quramiz. T. O‘zbekiston.2016. -B. 18 // www.google.uz

[2] Т.Рихсибаев ва б. Компьютер графикаси. – Т.: Тафаккур қаноти, 2012й.

The program has several conveniences for creating three-dimensional drawings in addition to two-dimensional ones, which are as follows:

1. The existence of a creator and a rotation axis is sufficient for creating surfaces;

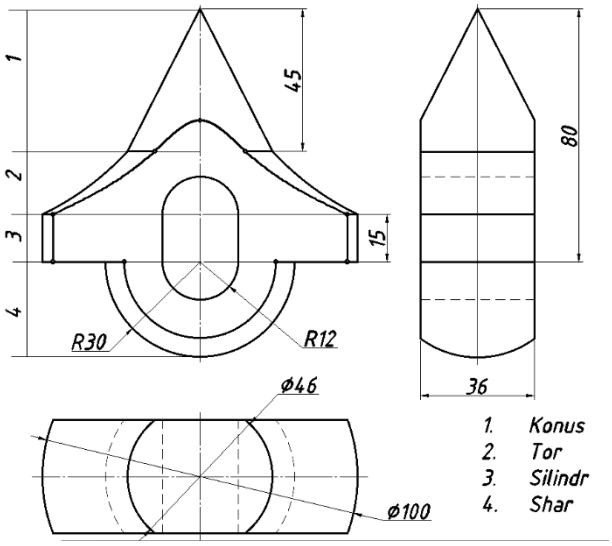
2. When working with views, it is possible to see each of them in three dimensions;

3. The drawn details can be colored with shadows and highlights;

4. Each drawn detail can be placed in dimensions intended for production;

5. There is an opportunity to view a 3D object from every angle.

We will familiarize ourselves with every panel needed for working in a 3D environment. We will discuss surfaces and performing operations on them. The drawing will be carried out in the following sequence.



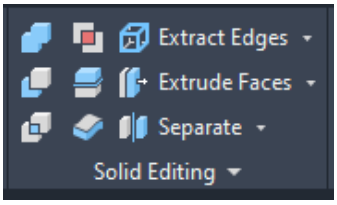
So, we have a surface given that has several rotational surfaces. We have studied how to draw each of these surfaces individually, and now we will try to combine them into a single drawing and perform a planar cut. For this,

1. We will leave the creator and axis of the surfaces.

2. Based on the "Revolve" command, we will draw the detail using the creator and axis.

1.
. To perform the planar cut, we will cut using the commands from the "Solid edition" panel.

“Solid edition” panel commands and their usage.



“Union” «Обьединение» In 3D modeling, separate individual parts are combined to form a single unified object. For this, the command is selected, the parts to be combined are marked, and it is confirmed by pressing "Enter". See Figure 1.

“Subtract” «Вычитание» Unnecessary parts of separate details that intersect with each other are removed from the main object. In this process, a command is initiated, the part to be kept is selected and confirmed by pressing "Enter", followed by selecting the part to be removed and confirming with "Enter". Figure 2.

“Intersect” «Пересечение» Retaining the combined part of two details that are merging with each other. In this process, a command is initiated, both details are selected, and confirmed by pressing "Enter". Figure 3.

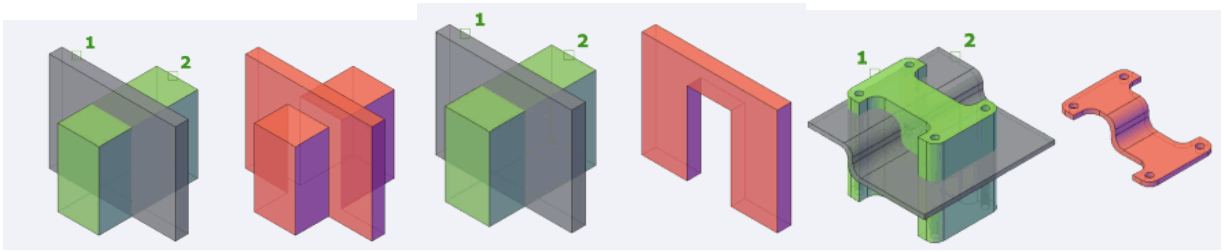
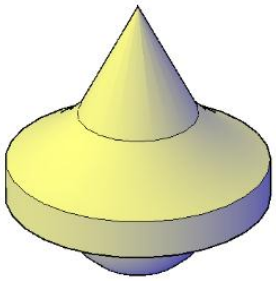


Figure 1 **Figure 2** **Figure 3**

We will perform a flat cut of our detail consisting of the combination of surfaces. The 3D model has been created using "Revolve" with a solid base. In the next step, we will draw boxes on both sides and use the "Subtract" command to execute the flat cut. This will result in the detail shown in Figure 6.

Figure 4



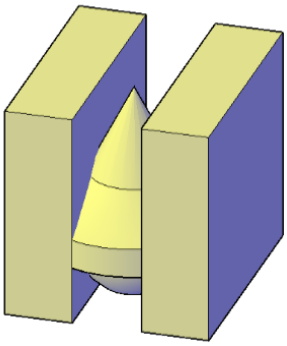


Figure 5

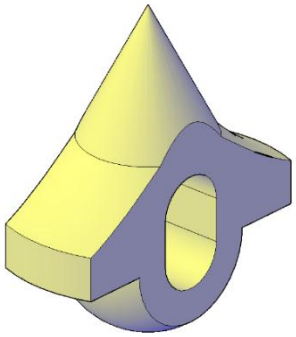


Figure 6

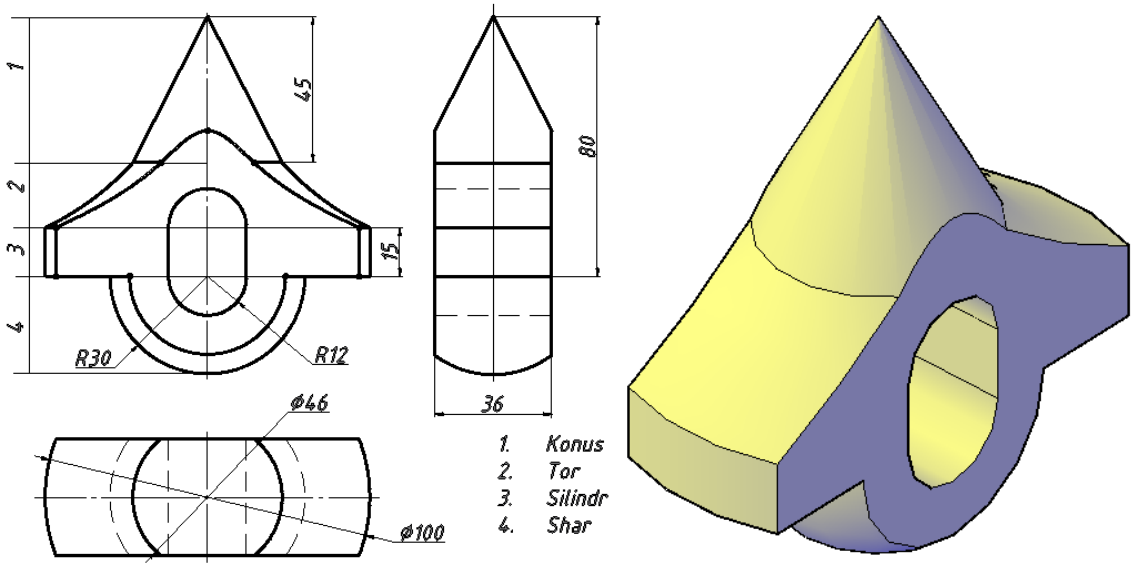


Figure 6

The aforementioned capabilities of 3D modeling on a computer demonstrate that a 3D drawing created on a computer has many advantages over a 3D drawing made on paper. These advantages include ease of drawing, high quality and accuracy, editing capabilities, and of course, the convenient option of managing parameters through modeling. On paper, especially complex surfaces of technical objects are approximated geometric parameters, whereas this issue is resolved in a 3D model on a computer. Today, most of the automated design systems used in modern manufacturing are in English, which is why the English terminology and functions of 3D

modeling tools are taken from foreign literature on AutoCAD, with the aim of developing skills for working with such systems in the future.

In mastering drawing and geometry, students must first learn to read drawings, execute them, gather graphic data, and draw schemes. It is known from engineering graphics that a designer or researcher primarily illustrates a representation of a technical device or a process model of a certain direction on paper. Although these illustrations are based on the orthographic projection method, they were initially done by hand in sketch form without the aid of drawing tools.

Directly drawing based on exact dimensions is impractical because it represents just an idea. Based on the drawings, the structure of the device and its operational principles are discussed, and specific adjustments are made. Additionally, sketches are used in the initial design of materials and parts, in repair work, and when creating drawings of details based on their origin.

Sometimes referred to as “technical drawings,” visual representations based on axonometric projections are also created since technical drawings can be done by hand without the use of drawing tools. The actual dimensions of a part are measured using measuring instruments and then transferred to the sketch.

It is evident from this that in order to draw a sketch or technical drawing by hand without the use of drawing tools, one must possess certain skills and proficiency in creating straight lines, circles, or ellipses. When sketches are created based on computer-aided design programs, if a three-dimensional model is used, the sketch and technical drawing can be done simultaneously. Now, this process is accomplished on a computer using modern advancements such as the AutoCAD software.

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