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Use of The 2d and 3d Graphic Programs Feature in Teaching Descriptive Geometry

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Abstract

This article discusses ways of developing a descriptive geometry curriculum and organizing teaching based on this curriculum. Theoretical and practical substantiation of the possibility of developing the spatial imagination of students by teaching descriptive geometry in real time in the graphics program AutoCAD.

Keywords: *Drawing Geometry, Real Time, Fan Program, Computer Technology, Autocad Graphics Program, Innovation, Educational Technology, Geometric Object, Point, Straight Line, Plane.*

1. Introduction

As a result of the establishment of the credit module system and the development of computer technologies in the higher educational institutions of our country, the teaching of drawing geometry and engineering graphics in the traditional way has become ineffective. Therefore, it is required to reform the teaching of drawing geometry and introduce innovative educational technologies.

In particular, A.A. Kakhharov [11], A.K. Khamrakulov's scientific research work is dedicated to improving the teaching methodology of drawing geometry based on computer technologies. It is emphasized that the use of computer technologies in the teaching of subjects gives effective results.

Farid Naseri's scientific research works are devoted to the use of AutoCAD graphics program in teaching the science of "Drawing geometry" [13]. A.Shonazarov researched the effectiveness of increasing students' mastery by teaching based on 2D and 3D virtual models (Geogebra) [12].

A.K. Khamrakulov's scientific research studies considered the drawing as a tool for teaching computer technologies in the teaching of geometry and engineering graphics. A.A. Kakhharov aims to develop students' spatial imagination with the help of computer technologies. The goal is to develop students' creative thinking skills by transforming 2D and 3D images.

From the above points, we can see from the data that the use of computer technology is an effective method in teaching science. For this reason, the revision of drawing geometry science programs taking into account the credit module system and its processing based on modern requirements remains an urgent problem of the day.

The drawing geometry science programs we offer have been developed on the basis of the credit module system and the qualifications and requirements of the majors, linked to practice.

An introduction to drawing geometry, Monge's apparatus, point projections, straight line, plane, drawing reconstruction methods, polygons, surfaces, and axonometric projections are given in the traditional science programs of drawing geometry and engineering graphics. When classes are organized through these science programs, certain problems arise in the development of students' spatial imagination and mastery of subjects [1,2]. For example, why do we need projections of points and straight lines are often asked by students. In order to reduce such questions, the science program was given information about geometric objects (such as cubes, prisms, pyramids, cones, cylinders) before the subjects of point, straight line, and plane. That is, information about what a cube is, its edges, vertices, diagonals and its views has been put. Information about prisms, pyramids, truncated pyramids, cylinders, cones, obtuse cones and their formation was also included. Information about geometric objects develops students' spatial imagination. This was followed by the topics of Monge's apparatus, projections of a point, straight line, plane, methods of drawing reconstruction, polygons, surfaces and axonometric projections. As a result, the hypothesis that the level of students' spatial imagination and mastery of subjects will be high was put forward [3].

Within the framework of the research hypothesis, scientific research works of A.K. Khamrakulov [1,2,3], AA.Kahharov [11], Ch.Shokirova, N.Yodgorov, U.A.Nasriddinova, D.Ochilova and pedagogical experiences of advanced professors and teachers studied and analyzed from a scientific point of view. In Sh. Tursunov's scientific research work, the issues of organizing classes based on modern pedagogical technologies were considered [9,10].

Experimental and control groups were selected in experimental studies. Training of drawing geometry was started in experimental groups based on the experimental subject program of "Drawing geometry and engineering graphics". Drawing based on the science program in teaching geometry, first about the model of geometric objects and virtual representation through the AutoCAD graphics program. Models were shown to students from different (front, top, left, right, top, bottom) sides. Students will also have the opportunity to hold the models in their hands and turn them in different directions. Then they can see how the geometric bodies are created through the AutoCAD graphics program (Figure 1). That is, when making a prism or cube through the program, the creation of its base and its growth in height are created in front of the students' eyes. This leads to the development of students' spatial imagination. At the same time, the intersection of geometric objects with each other, their intersection lines were shown through the capabilities of the program.

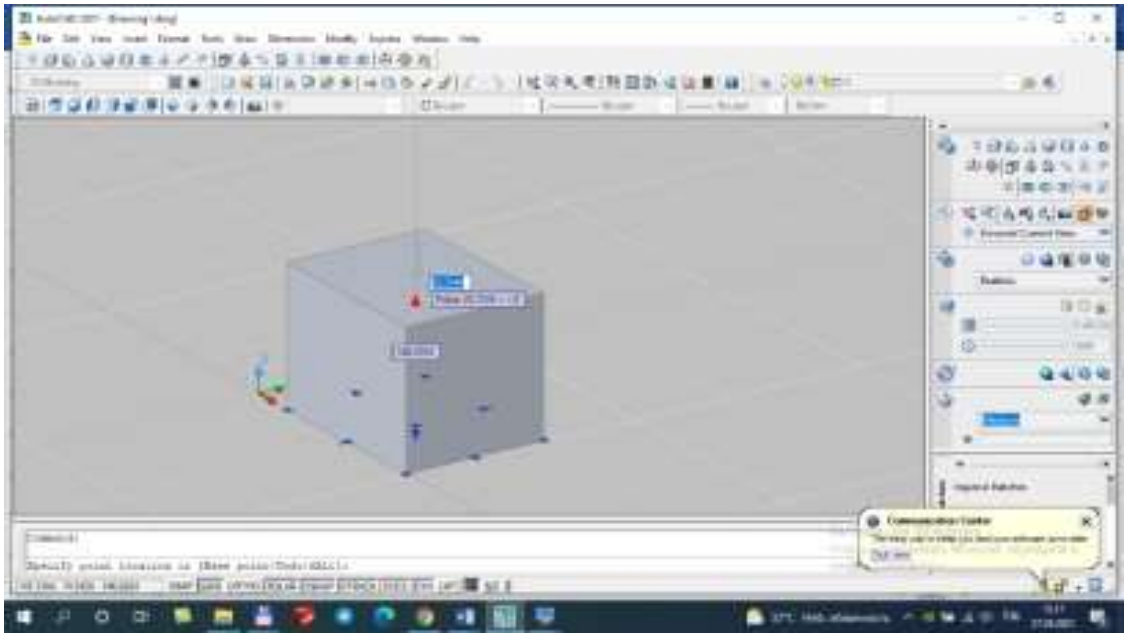

Figure 1. Construction of the cube

The working window of the graphic program can be divided into four, and it will be possible to depict the front, top, and left views of the cube in separate sections. It is explained that the views are frontal (front, back), horizontal (top, bottom), profile (left, right) views [5,6]. As a result, information about

projection planes and parallel projection is conveyed to students. Views must be displayed in their default state. With this, it will be possible to describe the cube formed in the form of a frame (Fig. 2). In the same way, a pyramid, an obtuse prism, a cone, a truncated cone, an obtuse cone, a cylinder, an obtuse cylinder are also displayed.

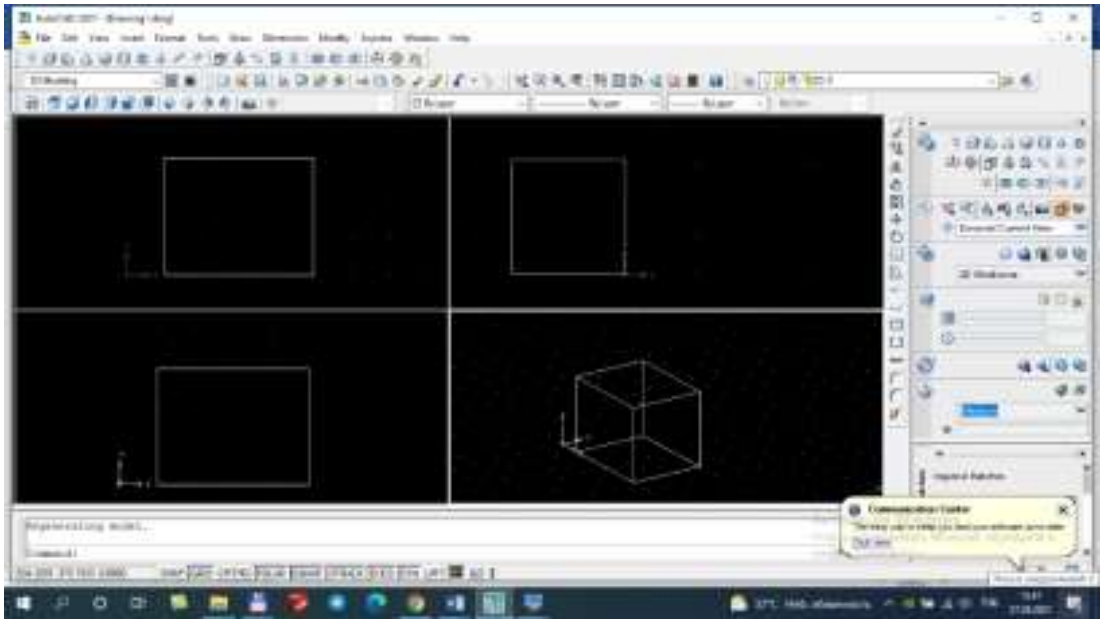

Figure 2. View of the cube in the frame state

After these topics, connecting the topics of point, straight line, and plane directly to geometric objects will make the students learn the topics easily. At this time point by students. straight line, there is no room for questions about why the projections of the plane are needed. They will be able to see that all geometric objects are made up of points, straight lines, planes, curves and surfaces.

Lectures on point and straight line, plane topics were conducted using AutoCAD graphics software. For example: Projection methods. Monge method. A cube is drawn in the AutoCAD graphic program, and one end of the cube is marked as a point (Fig. 3). Then its three views are displayed through the "VID" toolbar. Then, three projections of the point were drawn on the blackboard, and together with this, it was demonstrated through a pre-prepared Microsoft Power Point or GEOGEBRO electronic tutorial.

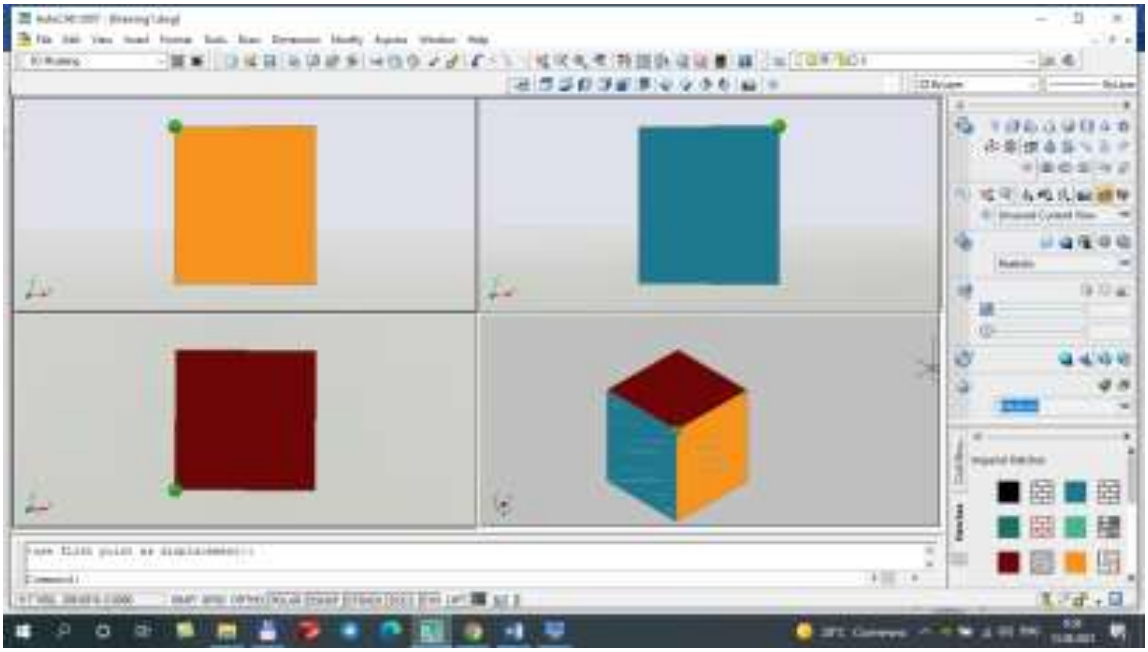

Fig. 3. A schematic view of a point on a cube

On the subject of a straight line, a pyramid was constructed in the AutoCAD graphics program, and the edge of the pyramid was taken as a straight line, and it was shown in practice that it would be a straight line in the general situation, since none of the projections is parallel to the plane.

Likewise, straight lines that do not meet (cross) can be represented and reported using the geometric body (Figure 4) below. This geometric object is a geometric object whose base is a hexagon, the upper base is turned at 45 degrees and the corners are connected to each other. If its edges are considered straight lines, they will be straight lines that do not meet (cross) each other.

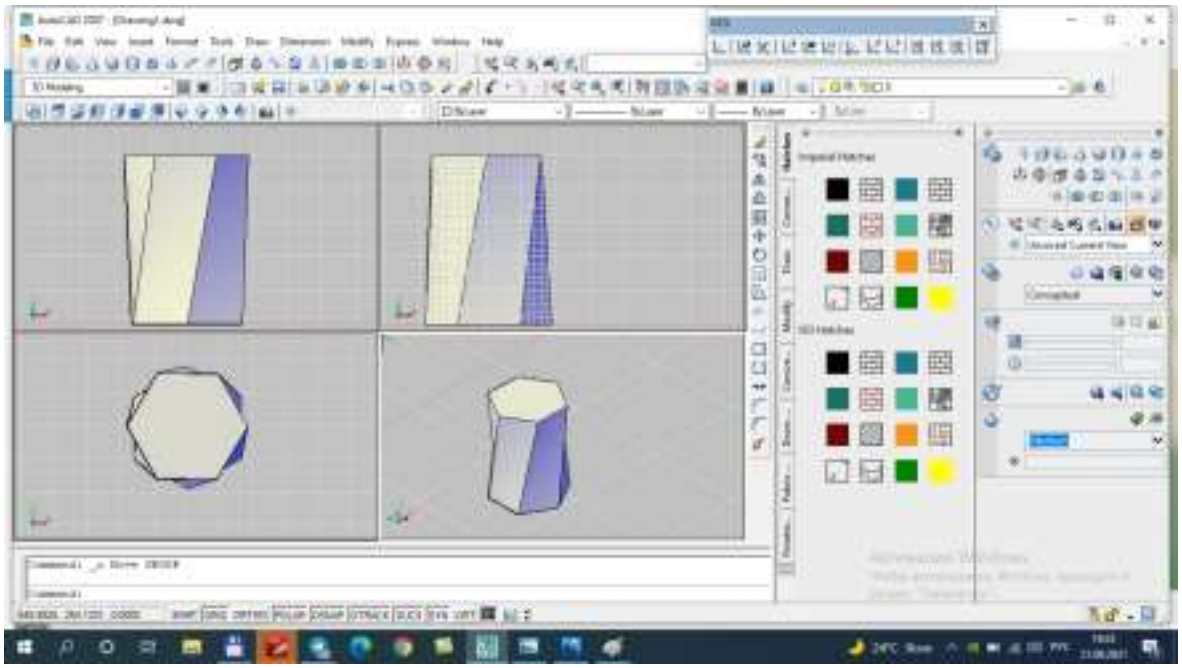

Figure 4. A geometric body with non-intersecting edges.

As a result of the above thought and the results of the conducted scientific research, the information about geometric objects included in the science program and the drawing of the geometry science using the AutoCAD graphic program will lead to the development of students' spatial imagination and qualitative improvement of the indicators of mastering the science.

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