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Scientific and Theoretical Basis of Teaching Practical Courses of Engineering and Computer Graphics

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Annotation: The article examines the practical and theoretical foundations of engineering and computer graphics practical training, their differences, and the effectiveness of their interdependence. Here, practical examples of the development of students' spatial imagination by teaching the solution of metric and positional problems in engineering and computer graphics practical classes are explained theoretically with the help of graphic problems.

Key words: basic geometric shapes (AGSH), space, metric problems, positional problems, straight line, planes.

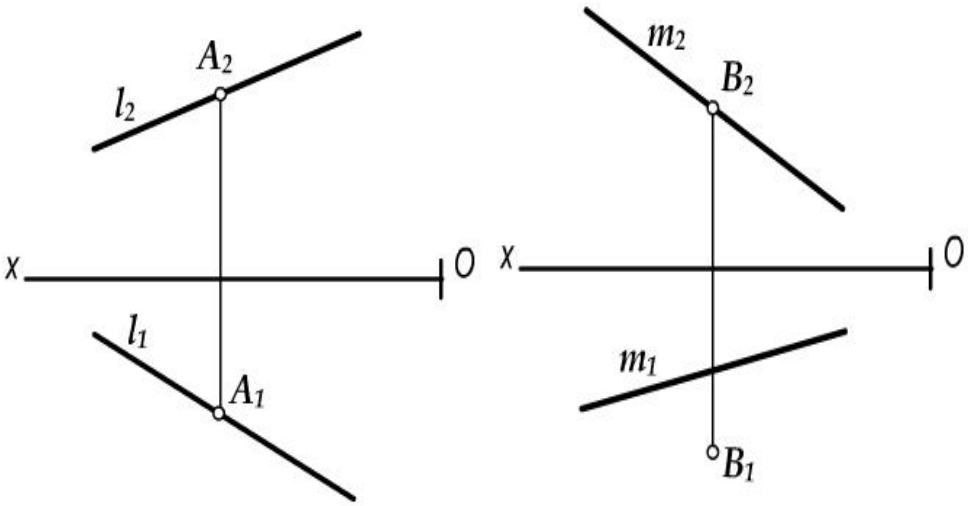
INTRODUCTION

Today, in the developing and changing times, the need for personnel with intellectual potential and high level of creativity is increasing. Taking this into account, special importance has been attached to the field of education in our country. That's why President Sh. M. Mirziyoyev is sharply commenting and demanding that "there is no development and no innovation without new thoughts and ideas." In one of his speeches, President Sh.M. Mirziyoyev stated that "... it is an important task to further develop not only academic science, but also science in higher educational institutions" 1. In our country, large investments are being made in the fields of construction, production and development of innovative technologies. There is a great need for qualified specialists working in these areas. The imagination and thinking of such specialists should be broad and the level of creativity should be high. The main focus in educational institutions is to identify such talented young people and direct them to the right fields. Professors and teachers of technical and pedagogic higher educational institutions have been working honestly to fulfill such a responsible task. In particular, drawing geometry and drawing, engineering computer graphics have their place and practical importance. Drawing geometry and drawing subjects have a certain advantage over other subjects in the development of students' spatial imagination and thinking. Because in these sciences, methods of creating an image of geometric shapes located in three-dimensional space on a two-dimensional plane or surface are studied. In addition, through the rules of these sciences, it is possible to restore the spatial position, shape, and shape of a geometric shape by drawing it on a plane. Here, a strong spatial imagination and thinking is required in order to realize and understand the "migration" from space to plane, and vice versa, from plane to space. Imagination and thoughts are cognitive operations in psychology.

Drawing geometry is a part of general geometry and learns to solve positional and metrical problems related to their shapes, sizes and mutual location using the methods of their description. Using the methods of description, it expands the spatial imagination of students. Making images based on given dimensions and ability to read pre-made images and help solve engineering problems during practice. Spatial thinking is a manifestation of mental activity, and it is a factor that ensures the creation of spatial images and work with them in solving practical and theoretical problems. In this complex process, not only logical (explained by words) practices, but further actions are built on the basis of thinking, it is easier to recognize an object and change its shape in contrast to the verbal method. Spatial thinking, location determination, objects and natural

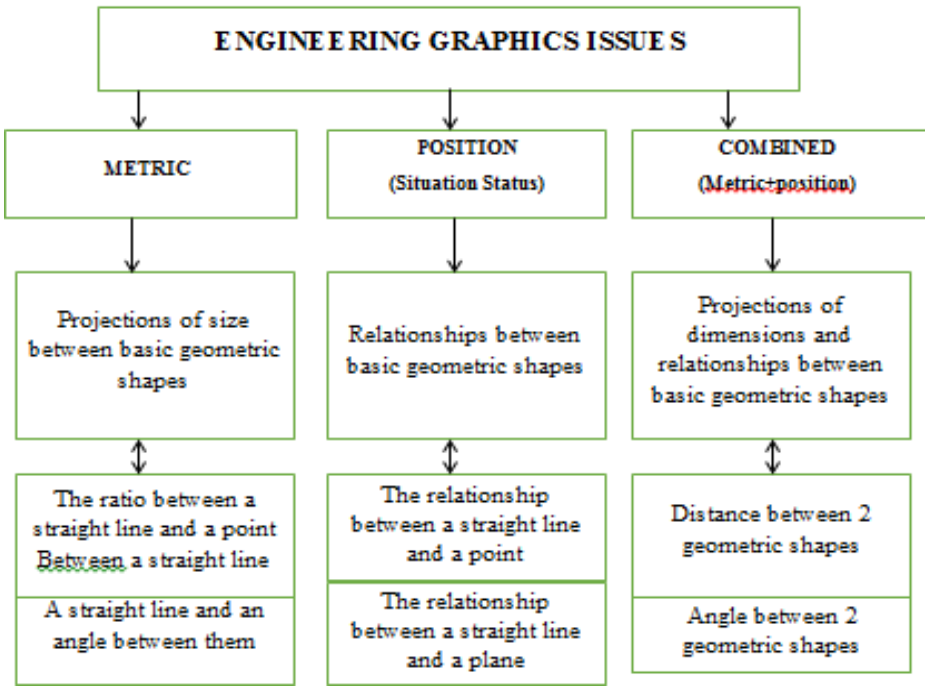
phenomena it can be said that it is the main component in solving problems related to the world and is formed earlier than figurative thinking. The development of imagination is one of the important conditions for having the ability to read and make drawings. At the same time, the process of teaching science is the most important tool for developing imagination.

In the drawing in figure 1.a, the projections of point (A_1,A_2) correspond to the projections of straight line l (l_1, l_2), respectively. Therefore, the point A belongs to the straight line.



In our research, one positional problem is presented as an example, and the possibilities of developing the student's spatial imagination and thinking in the process of teaching it are shown. First of all, what kind of issues are called positional issues? let's answer the question. "Problems aimed at determining the third geometric shape formed by the interaction of two geometric shapes are called positional problems." For example, the intersection of two planes, the intersection of a straight line with a plane, the intersection of two surfaces, the transfer of parallel and perpendicular planes, etc.

Engineering graphics considers two main issues. Classification of positional and metric issues:



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Divide the section into equal parts	The relationship between a plane and a point	Perpendicularity or parallelism of 2 geometric figures
Divide the cross section in the given ratio	A situation between a plane and a straight line	Whether or not 2 geometric shapes belong
Planes and the angle between them	Mutual situation of planes and plane	Find the distance between intersecting straight lines located in

The main reason why they are called metric problems is that problems related to the distances between geometric objects are performed. For example, the shortest distance from a point to a straight line, the shortest distance between straight lines, and the distance from a point to a plane Since the problems are related to distance, we call them metric problems. The student sees and perceives a geometric shape in space. Also learns to construct its orthogonal projection on the plane. So, the student imagines the operations of perception and imagination of cognitive activity. Various visual posters and animations are used during the lesson, because geometric shapes such as points, lines, and planes are abstract concepts. As a result, visual perception is created. In life, you can never see a point, a line or a plane with your eyes and touch it with your hands. These are terms accepted in science, and all details, objects and even objects in nature in life and technology are formed by mutual combination of points, lines and planes.

Points, straight lines, and planes are simple geometric shapes, among which various positional and metric problems are presented in educational literature.

A point may or may not belong to a straight line. To solve this problem, it will be enough to analyze the projections of a straight line and a point, that is, if the projections of the same name of the point lie in the projections of the same name of the straight line, then the point belongs to the straight line and, on the other hand, if any projection of a point does not belong to any of the projections of a straight line, then the point does not belong to a straight line.

If we analyze the mutual location of a point and a straight line

Point A may belong to n straight lines. (AN) and may not be relevant (AN Figure 3).

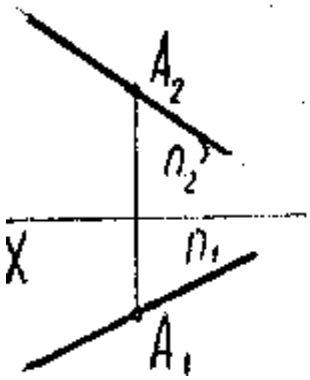


Figure 3

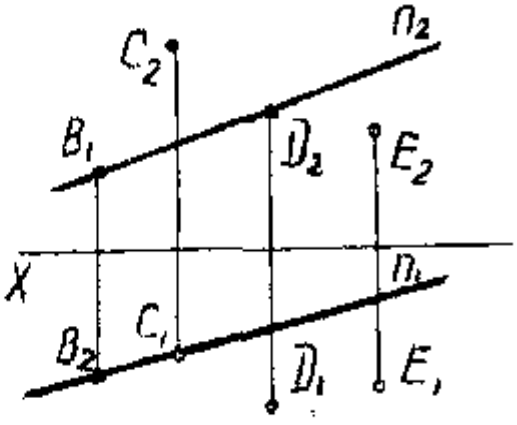


Figure 4

The drawing 3-a) shows the point A belonging to n straight line.

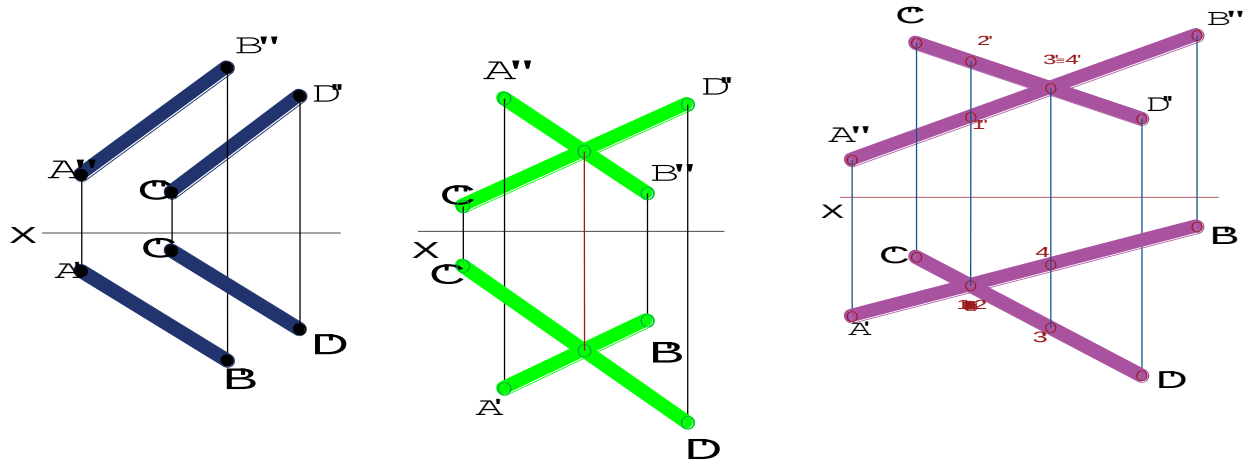
Drawing 3-b) shows n points that do not belong to a straight line

Two straight lines can be parallel, intersect and not meet.

Parallel straight lines. The projections of lines parallel to each other in space are also parallel to each other, that is, if (AB)II (SD) is (A1 B1) II (S1 D1); (A2 B2) II (S2 D2) and (A3 B3) II (S3 D3).

Crossed lines. Two straight lines that have a common point in space are called intersecting lines.

The projections of intersecting lines of the same name also intersect, and their intersection points are perpendicular to the axis of projections OX on the graph. (K1,K2 are perpendicular to OX)



Cross lines. Straight lines that are not parallel to each other and do not intersect are called non-intersecting lines. Since the projections of the same name of the non-meeting lines intersect, their points of intersection do not lie on the plane of the two projections on the same perpendicular.

Points 1 and 2 and 3 and 4 in the drawing are competing points. When looking from top to bottom, 2 points are visible, 1 point is not visible. So, in the horizontal projection, 2 is visible and 1 is invisible. In the frontal projection, 3 is visible and 4 is invisible.

CONCLUSION

So, the student analyzes the interaction of the straight line in space with its traces and projection planes, thinks about it, thinks about it, imagines the process of geometric creation, i.e. reality, and mentally discusses it. This situation is considered cognitive activity, and mental stress occurs in the student. There will be a clash of ideas. The student comes to a final conclusion during short or long thinking, reflection, comparison, analysis, practical investigation and decision making. If the solution is correct, it's a great light on light. In case of a mistake, the teacher asks the student questions that will lead him to the correct answer, reminds him of the algorithm presented in diagram 2 and the diagram. The main achievement here is that the student was encouraged to think, to think, to visualize something abstract, to embody geometric constructions in his imagination, and it was implemented. To sum up, how to solve many positional and metrical problems in drawing geometry and how to teach it correctly will ensure the development of students' spatial imagination and thinking. Then we will have a young generation with an independent opinion, a creative approach to problems and certainly able to find a solution to it.

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