

## TEACHING DRAWING AND DRAWING GEOMETRY IN HIGHER EDUCATIONAL INSTITUTIONS

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**Abstract.** *When solving positional and metric problems solved using the projection methods of drawing geometry, it is possible to solve the problems based on the given conditions, as well as the methods of reconstruction of drawings, as well as the methods of auxiliary projection. In this case, a given geometric shape with orthogonal projections is additionally projected onto the plane of projections taken arbitrarily. Then, a convenient projection center or direction satisfying the given condition of the problem is selected, and new projections of the form are created.*

**Keywords:** *drawing, descriptive geometry, pedagogy, psychology, engineering graphics, training, education, upbringing.*

The educational system is a set of all types of educational institutions operating on the basis of the main principles of the state policy in the field of education in order to educate the young generation.

The continuous education system of the Republic of Uzbekistan includes pre-school education, general secondary education, secondary special education, vocational education, family education, post-school education, training and retraining of personnel, management of non-school educational institutions and their activities. includes organs.

Education in the Republic of Uzbekistan is carried out in the following ways.

1. Pre-school education.
2. General secondary education.
3. Secondary special, professional education.
4. Higher education.
5. Post-secondary education.
6. Improvement of staff qualification and their retraining.
7. Extracurricular education.

An image on a plane that can show the exact shape of an object intact and its dimensions is called a drawing. A drawing is a design document with a reproducible feature.

Each designer makes the most optimal decision in the process of designing this or that item, taking into account the knowledge he acquired from geometry, using his highest level - creative activity. Because technical, technological and economic conditions have to be taken into account in each designed item.

I. Rahmonov and A. Valiev explained the role of modern pedagogical technologies in teaching engineering graphics.

The first Uzbek textbook on methodology was published under the co-authorship of Professor E. Roziev and Associate Professor A. Ashirboev.

The textbooks written by I. Rahmonov for students of general secondary schools are of great service to our young people's mastery of graphic education.

The textbook of associate professor A. Ashirboev, teaching manuals of professors E. Ruziev and R. Latipov are used for vocational colleges.

We can give many examples of scientific research works and educational literature written by our scientists. In short, scientists from Uzbekistan E.Sobitov, J.Yodgorov, L.Hakimov, P.Adilov, T.Rikhsiboev, R.Ismatullaev, T.Azimov, D.F.Kochkarova, E.Roziev, Sh.Abdurahmonov, A. Abdurahmonov, A.Ashirboev, A.Valiev, N.Yodgorov, M.Khalimov, S.Saydaliev and others contribute to the development of science with their educational literature and scientific articles.

Images of objects in the drawing should be performed using the rectangular projection method. To reduce the number of images, it is allowed to show the necessary invisible parts of the surface of an object in views using dashed lines.

View of an object (view) is an orthogonal projection of the visible part of the surface of an object facing the observer, located between it and the projection plane.

The main view of an object (main view) is the main view of an object on the frontal projection plane, which gives the most complete idea of the shape and size of the object, relative to which the other main views are located.

Additional view of an object (additional view) - an image of an object on a plane not parallel to any of the main projection planes, used for an undistorted image of the surface, if its cannot be obtained in the main view.

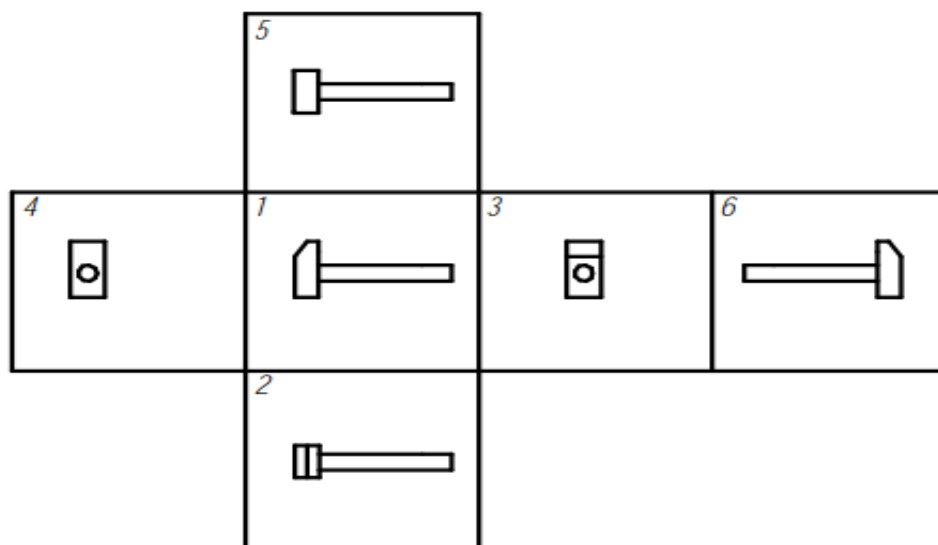
Local view of an object (local view) is an image of a separate limited area of the surface of an object.

Main type of item (main type) – type of item that was received by combining an object and its image on one of the faces of the hollow a cube, inside which an object is mentally placed, with a drawing plane.

The main type of an object can refer to the object as a whole, its section or section.

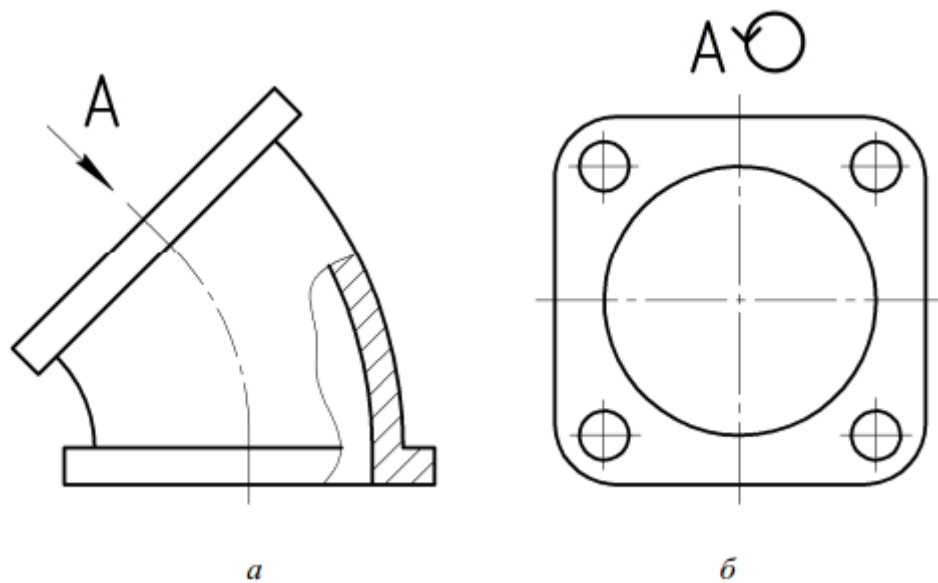
The following names have been established for the main views obtained on the main projection planes (main views, Figure 1):

- 1 – front view (main view);
- 2 – top view;
- 3 – left view;
- 4 – right view;
- 5 – bottom view;
- 6 – rear view.



*Figure 1 – Location of main views on projection planes*

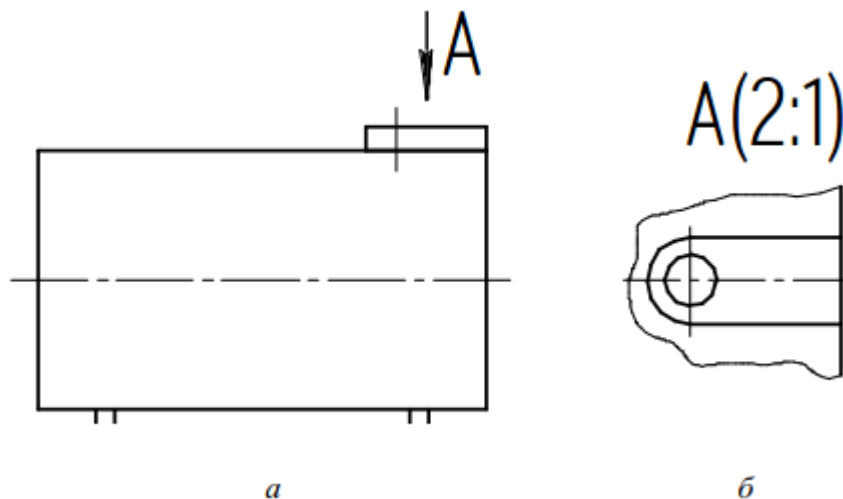
If any part of an object in the drawing cannot be shown without distorting the shape and size, then additional views are used, obtained on planes not parallel to the main projection planes.



*a – main view; b – additional view*

Additional view (Figure 2, b) must be marked on the drawing capital letter, there must be an arrow indicating the direction view, with the corresponding letter designation (for example, arrow A). An additional view may be rotated, and the view designation must be supplemented with a conventional graphic designation.

The local view (Figure 3, b) can be limited to the cliff line, as small as possible, or unlimited. The detail view should be marked on the drawing like the supplementary view.



*a – main view; b – additional view*

For two given types of parts, read the given complex drawing, mentally imagining the configuration of the part shown in the drawing.

Evenly distribute the drawing field on the left side of the A3 sheet into the main view, top view, side view. Place the axonometric projection of the part on the right above the main inscription of the drawing.

Draw the axes of symmetry, outline with thin lines the overall outlines in the projection connection of the three images of the part.

Redraw two given types of parts. Construct a third view in projection connection with the main view.

Construct an axonometric projection of the part.

Apply dimensions on all three types of parts.

A sketch is a graphic document of a temporary nature, made by hand, without exact adherence to scale, with the obligatory preservation of the proportions of all elements of the part (eye scale), containing all the necessary information about the shape, size, surface roughness and material of the part for its manufacture.

Sketches are divided into:

a) for preliminary developments of new designs, according to which prototypes of parts or working drawings are made;

b) sketches made from finished parts, i.e. when repairing products, manufacturing parts for temporary devices, etc.

The sketch must meet the following basic requirements:

1 Be neatly executed.

2 Contain the necessary and sufficient number of species that give a clear idea of the geometric shapes of a part.

3 Have the dimensions and maximum tolerances required for the manufacture of parts inclinations, signs showing surface roughness, surface coating, heat treatment.

4 Contain information about the material from which the part should be made.

5 Have all additional information that cannot be shown by the image, but is necessary for the manufacture of the part.

Sketches and drawings of parts do not differ in content, but differ only in execution technique. Sketches are made on sheets of any paper (checkered paper is recommended) on a visual scale, at which the proportions of the part and its elements in all images must be ensured, and drawings are made using drawing tools on drawing paper in compliance with the scale.

Sketches of parts, as well as working drawings, are performed using the rectangular projection method. The sketch must contain the same information as the working drawing of the part. Sketches are performed when designing new machines, reconstructing existing ones, or during repair and certification of equipment.

The content of the sketch should reflect the shapes of the external and internal surfaces of the part with a minimum but sufficient number of views, sections, sections and extensions to reveal the design features, and also have all the dimensions necessary for its manufacture.

Sketches are made on sheets of any standard size paper. In the educational process, it is recommended to make sketches on squared paper or on graph paper of standard formats.

A sketch can serve as a document for the manufacture of a part or for the execution of its working drawing. Therefore, the sketch of the part must contain all the information about its shape, dimensions, and material. Also on the sketch is placed other information, presented in the form of graphic or text material (technical requirements, etc.).

determined on the basis of the priority of the auxiliary projection of graphic processes in drawing and descriptive geometry, design functions and motivational-value, cognitive, practical-activity, reflexive-evaluative components of the logic of optimal provision of creative activity, aimed at finding a creative solution to educational problems;

the model for the development of students' creative competence has been improved by teaching auxiliary design methods based on the pedagogical design of the technological mode of strict definition of methodological conditions, such as maximum consideration of individual characteristics, ensuring the stability of the creative atmosphere, accelerating the dialogic joint activity;

the methodology for the development of creative activity in the courses of drawing and descriptive geometry has been improved on the basis of strengthening the degree of intensity of the relationship of such heuristic methods as (“mentalist”, “studes”), aimed at finding the unknown, based on the associative, intuitive and logical basis of the elements (technical design, construction, design), necessary for the development of creative activity in drawing and descriptive geometry;

the pedagogical mechanism for the development of creative thinking of future teachers has been improved on the basis of expanding the positive dynamics of compositional and creative activity, regular correction of reflexivity by a system of subject-subject relations aimed at manifesting the student's personal potential.

According to the results of a study on improving the methodology for developing the professional graphic competence of future engineer-teachers:

Practical suggestions and recommendations for determining on the basis of the priority of the auxiliary projection of graphic processes in drawing and descriptive geometry, design functions and motivational-value, cognitive, practical-activity, reflexive-evaluative components of the logic of optimal provision of creative activity, aimed at finding a creative solution to educational problems are used when developing qualification requirements for the undergraduate direction 60111200-Fine Arts and Engineering Graphics (Reference No. 02 / 01-01-13 of the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan, Center for the Implementation of Advanced Technologies and Research on the Development of Higher Education dated June 14, 2022). As a result, this served to improve the engineering competencies of future teachers of fine arts and drawing.

Practical suggestions and recommendations for improving the model for the development of students' creative competence by teaching auxiliary design methods based on the pedagogical design of the technological mode of strict definition of methodological conditions, methods for developing creative activity in drawing and descriptive geometry courses based on strengthening the degree of intensity of the relationship of heuristic methods were used in the development of a teaching aid "Drafting" (Reference No. 237-653 of the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan dated May 31, 2021). As a result, this served to increase the efficiency of mastering the methods of auxiliary projection of students.[11]

Practical suggestions and recommendations for improving the pedagogical mechanism for the development of creative thinking of future teachers based on the expansion of the positive dynamics of compositional and creative activity, regular correction of reflexivity by the system of subject-subject relations aimed at manifesting the student's personal potential were used in organizing the activities of the organization A&A Ausbildung und Arbeit Plus GmbH in Bremen in Germany. (Certificate of the organization A&A Ausbildung und Arbeit Plus GmbH in Bremen in Germany No. 2928207 dated March 16, 2022). As a result, this served to increase the effectiveness of preparing future teachers for professional creative activity.[12]

Before you start making a sketch, you need to carefully study the structural forms, mentally break down the part into separate geometric elements (shapes); set the working position of the part or the position most favorable for the image; determine the main view and the required number of projections; select the appropriate paper format (size), draw a frame for the drawing (sketch), and allocate space for the main inscription.[10]

Today, in our republic, pedagogues are being trained for higher education institutions, specializing in 5A110802-Engineering graphics and design theory. However, bachelors who graduated from a technical university cannot apply for this specialty. This is a big problem. In our opinion, bachelors who studied engineering graphics at a technical university with excellent grades

should be allowed to apply for studies in the specialty 5A110802-Engineering graphics and design theory. Then the recruitment process will be large, the admission quotas will be increased, and most importantly, quality personnel will be trained and competitive personnel will be supplied to the technical vocational training institutes.[13]

Ways to eliminate the shortcomings and problems indicated above should be developed and put into practice in the teaching of drawing geometry and drawing sciences, training of quality specialists. This will certainly serve the development of the education sector in our country, training of competitive personnel.

Development of the methodology of using the possibilities of computer graphics science in the teaching of drawing geometry and drawing. Nowadays, the science of computer graphics is developing rapidly. The drawings of all modern buildings and technical devices are drawn using a computer using various graphic programs. In educational types, the theoretical materials of drawing geometry and drawing are explained to students by hand drawing. Of course, the rules and theories of drawing should be explained in the traditional teaching method. But today, drawing by hand is considered an outdated method. Therefore, it is necessary to carry out scientific research on how to use graphic programs in the drawing of objects during the period when the theories of drawing geometry and drawing are being taught. That is, we believe that it is necessary to scientifically develop the integration and teaching methodology of engineering and computer graphics.

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