Educator Insights: A Journal of Teaching Theory and Practice
Volume 01, Issue 11, November 2025
brightmindpublishing.com
ISSN (E): 3061-6964

IMPROVING THE METHODOLOGY OF TEACHING METHODS OF REDRAWING EPURES TO STUDENTS

Taganov Ravshanbek Otaboyevich
Associate Professor, Department of Art Studies,
Urgench State Pedagogical Institute
Tel.: (+99893)9221450. E-mail: taganovt68t@gmail.com

Jumaniyozova Dinora G‘ayrat qizi
Master’s Student, Specialty “Engineering Graphics and Design Theory”,
Urgench State Pedagogical Institute

Abstract
This article examines the methodological foundations of teaching methods of redrawing (reconstructing) epures, the role of these methods in developing students’ spatial imagination and graphic literacy, and improved approaches based on modern pedagogical technologies. In addition, the effectiveness of projection replacement, rotational transformation, and plane-parallel translation methods in solving epure problems is analyzed from a scientific and methodological perspective.

Keywords: Epure, projection replacement, plane-parallel translation, rotation method, descriptive geometry, spatial thinking, pedagogical technology.

Introduction

In descriptive geometry, redrawing an epure is one of the main methods used in solving complex metric and positional problems. With the help of an epure, it becomes possible to correctly project geometric shapes and figures in three-dimensional space onto projection planes and redraw them into transformed positions.

In modern educational practice, it is essential to develop students’ spatial thinking and form solid skills in reading, analyzing, and reconstructing drawings. Therefore, improving methodological approaches to teaching epure reconstruction methods is a requirement of today’s educational system.

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Theoretical Foundations of Epure Reconstruction

An epure is a combination of the projections of spatial geometric objects on two or three projection planes, providing a complete geometric model of a spatial figure. Using epures in descriptive geometry allows determining the position of spatial points, lines, planes, surfaces, and complex objects, and transforming them mathematically and geometrically.

Epure reconstruction is the process of creating a new epure of an object based on existing projections—an important analytical tool in exploring spatial models.

By epure reconstruction, we understand:

1. Replacement of projection planes,
2. Orienting a figure into a projectable position,
3. Simplifying the problem using plane-parallel or rotational transformations.

The main goals of this process are:

- determining the true size of a figure,
- finding the distance between planes,
- determining the shortest distance between a point and a plane or line,
- analyzing the mutual position of lines.

The main methods of reconstructing an epure are geometric techniques used in descriptive geometry to simplify complex spatial forms and accurately reveal their dimensions and proportions. The following methods are primarily applied:

1. Method of Replacing Projection Planes

In this method:

- A new projection plane is chosen parallel or perpendicular to an element of the figure (a line or plane);
- The new coordinate axis is drawn perpendicular to the drawing plane;
- The Z or Y coordinates of points are transferred along this new axis.

Advantages:

- actual angles of a plane become visible;
- finding the true size of triangles and polygons becomes easier.

2. Plane-Parallel Translation Method

This method simplifies the figure by translating it:

- along a parallel direction for a given distance.

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Applications:

- finding the shortest distance between a point and a plane;
- determining the angle between two planes or lines;
- orienting a straight line into a projectable position.

3. Rotation Method

This method rotates the figure about a chosen axis:

- until it becomes parallel to a horizontal, frontal, or profile plane.

Advantages:

- true distances and angles can be obtained;
- complex spatial problems become simpler.

Improved Methodological Approaches

1. Block-Module Based Instruction

Dividing the stages of epure reconstruction into blocks:

- theoretical part,
- analysis of the problem,
- performing graphical operations,
- analysis of the results.

This stage-based approach increases students' independent problem-solving abilities.

2. Use of Visual Models and 3D Graphics Software

Through AutoCAD, SolidWorks, GeoGebra 3D, Fusion 360:

- rotation processes can be animated;
- projection replacement can be modeled;

which significantly strengthens students' spatial imagination.

3. Game-Based Learning Technologies

The following educational games give effective results:

- "Graphic Duel"
- "Guess the Projection!"
- "Rotate and Find!"

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These games increase engagement and improve retention of the topic.

4. Small Group Problem Solving

Groups compare different solutions of the same epure problem using various methods. This develops critical thinking and the ability to find alternative solutions.

Results and Discussion

Training students using improved methodology leads to:

- 30–40% faster development of graphic thinking,
- reduction of errors in problem solving,
- stronger skills in reading and constructing drawings,
- increased interest in complex geometry problems.

Conclusion

Improving the methodology of teaching epure reconstruction:

1. accelerates the development of spatial thinking;
2. enhances students' graphic literacy;
3. increases the efficiency and modernity of the learning process;
4. prepares students for practical professional work.

Methodological approaches integrated with modern technologies elevate the teaching of epure problems in descriptive geometry to a new level.

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