FORMATION OF PROFESSIONAL COMPETENCES OF STUDENTS THROUGH THE TEACHING TECHNOLOGY OF THE METHODS OF EXECUTION OF ARCHITECTURAL CONSTRUCTION DRAWINGS

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Abstract

This article examines modern pedagogical technologies used in teaching architectural construction drawing methods. The research focuses on developing students' competencies in computer graphics software, architectural model making, spatial representation methods, parallel projection techniques, and geometric analysis of spatial and planar forms. The study also highlights the importance of developing spatial imagination and engineering thinking skills through problem-solving tasks and research-based learning approaches. Modern educational technologies allow students to integrate theoretical knowledge with practical application, which increases their professional readiness in architecture and construction fields. In modern higher education institutions, architectural construction drawing is considered one of the fundamental subjects that forms the professional base of future engineers, architects, and designers. Teaching this subject using innovative technologies increases the efficiency of the learning process and improves students' motivation toward professional activity.

Keywords

architectural graphics, engineering drawing, computer graphics, spatial thinking, projection methods, model making, educational technology

Introduction

The rapid development of digital technologies has significantly influenced architectural and construction education. Today, professional specialists must not only possess theoretical knowledge but also practical digital design skills. Architectural construction drawings are fundamental tools used to communicate design ideas, structural solutions, and technical specifications. Modern teaching technologies aim to integrate classical descriptive geometry methods with computer graphics tools.

This integration helps students better understand spatial relationships, projection principles, and geometric transformations. Teaching architectural drawing methods also contributes to forming analytical thinking, accuracy, and technical culture.

The introduction of digital learning platforms, virtual laboratories, and automated design tools has transformed traditional teaching methods. Students now have opportunities to perform complex design tasks using simulation tools and professional software.

The Role of Computer Graphics in Architectural Drawing Education

Computer graphics software plays an important role in modern architectural education. Students learn to create 2D drawings and 3D models, perform visualization, and analyze building structures. Using computer graphics helps students understand projection principles, object proportions, and spatial orientation.

Digital modeling allows students to test different design solutions and detect possible structural errors before construction. It also improves visualization skills, which are essential for presenting architectural projects to clients and engineers.

The use of Building Information Modeling (BIM) technologies further expands students' professional competencies by allowing them to integrate architectural, structural, and engineering systems into a single digital model.

Model Making in Architectural Education

Physical and digital model making helps students understand real structural relationships. Creating building models develops manual skills, spatial imagination, and constructive thinking. Students can analyze building proportions, structural stability, and design aesthetics through model making activities. Model making can be performed using cardboard, plastic, foam materials, or 3D printing technologies. Each method provides unique educational benefits and enhances students' understanding of construction processes. Digital model making using 3D modeling software and rapid prototyping technologies is becoming increasingly popular in architectural education.

Methods of Representing Spatial Forms on Plane Surfaces

Representing spatial objects on flat surfaces is one of the most important tasks in engineering graphics. Students learn orthographic projection, axonometric projection, and perspective drawing methods. These techniques allow accurate representation of three-dimensional objects on two-dimensional drawing planes. Parallel projection methods are especially important for technical drawings because they preserve object proportions and geometric accuracy. Students learn how to

interpret spatial objects using their flat projections. Understanding projection transformations helps students avoid design mistakes and improves drawing accuracy.

Geometric Analysis of Spatial Objects Using Projections

Projection drawings help analyze geometric properties such as distances, angles, and shape relationships. Students clearn how to determine real dimensions of objects based on projection views. This is important for accurate construction documentation. Geometric analysis develops logical thinking and analytical skills. Students learn to solve engineering problems using graphical methods. Students also learn to analyze intersections of surfaces, cross-sections, and complex structural nodes using projection methods.

Positional and Metric Relationships Between Spatial and Planar Forms

Understanding relationships between objects in space is essential in architecture. Students learn how to determine object positions, intersections, and distances using projection drawings. Metric relationships include measurements of lengths, areas, and volumes. Positional relationships include parallelism, perpendicularity, and intersection of objects. These skills are essential for professional engineering activity. Teaching these relationships improves students' ability to read technical documentation correctly.

Development of Spatial Imagination and Engineering Thinking

Spatial imagination allows students to mentally visualize objects from different viewpoints. Engineering thinking helps solve technical problems logically and systematically. Teaching architectural drawing methods contributes to both skills development. Problem-based learning tasks help students develop analytical and research abilities. Practical exercises strengthen theoretical knowledge. Engineering thinking includes the ability to optimize design solutions and predict possible construction problems.

Relationship Between Image Plane and Three-Dimensional Space

The relationship between drawing plane and three-dimensional space is based on projection geometry laws. Understanding this relationship helps students correctly interpret drawings and create accurate technical documentation. Students learn how spatial objects are transformed into planar representations while preserving geometric properties. This knowledge is especially important for structural analysis and design planning.

Teaching Methods and Educational Technologies

Modern teaching technologies include interactive learning, digital simulations, project-based learning, and research-based education. These methods improve student engagement and learning efficiency. Using digital tools, virtual laboratories, and simulation software helps students better understand complex engineering concepts. Blended learning technologies combine traditional classroom teaching with online educational resources.

Research Methodology

The research is based on analysis of pedagogical literature, practical teaching experience, and student performance assessment. Experimental teaching methods were applied to evaluate the effectiveness of modern educational technologies. Statistical methods were used to analyze student performance before and after implementation of modern teaching technologies.

Results and Discussion

The results show that integration of computer graphics and classical drawing methods improves student learning outcomes. Students demonstrate better spatial understanding, drawing accuracy, and problem-solving skills. The use of project-based tasks increases student motivation and professional readiness. Students who used digital modeling tools demonstrated higher performance in design tasks compared to those using only traditional methods.

Conclusion

Teaching architectural construction drawing methods using modern educational technologies significantly improves students' professional competencies. The integration of digital tools, projection methods, and model making activities develops spatial imagination, engineering thinking, and practical design skills. These teaching approaches prepare students for modern architectural and construction industry requirements. Future research should focus on integrating artificial intelligence tools into architectural education.

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