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METHODOLOGY OF TEACHING CONSTRUCTION DRAWING USING MODERN GRAPHIC PROGRAMS

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Abstract: This article analyzes the methodology of teaching construction drawing using modern graphic programs. The role of graphic programs in the field of construction is increasing, as they are used as effective tools in creating architectural and building designs. The article provides information on what methodical approaches can be used in teaching these programs, how to develop students' imaginations, and how to correctly create construction projects with the help of drawings.

Keywords: graphic programs, construction drawing, AutoCAD, Revit, teaching methodology, architecture, drawings, 3D modeling, education

МЕТОДИКА ОБУЧЕНИЯ СТРОИТЕЛЬНОМУ ЧЕРТЕЖУ С ИСПОЛЬЗОВАНИЕМ СОВРЕМЕННЫХ ГРАФИЧЕСКИХ ПРОГРАММ

Аннотация: В данной статье анализируется методика обучения строительному рисованию с использованием современных графических программ. Роль графических программ в сфере строительства возрастает, поскольку они используются как эффективные инструменты при создании архитектурных и строительных проектов. В статье представлена информация о том, какие методические подходы можно использовать при преподавании этих программ, как развивать воображение учащихся и как правильно создавать строительные проекты с помощью чертежей.

Ключевые слова: графические программы, строительный чертеж, AutoCAD, Revit, методика обучения, архитектура, чертежи, 3D-моделирование, образование.

INTRODUCTION

Construction drawing is one of the important foundations of architecture and construction design. To work in this field, students need to be able to draw not only traditional drawings, but also drawings using modern graphic programs. Currently, there is an opportunity to create 2D and 3D drawings using graphic programs such as AutoCAD, Revit, ArchiCAD. If these programs are used in teaching, new opportunities will open up for students in understanding and creating drawings. This article will discuss effective methods for teaching

construction drawing using modern graphic programs. The construction drawing course in a higher educational institution is aimed at forming the graphic culture of students, as well as the creative potential of the individual. Many effective works have been carried out in this area, in particular, in teaching the discipline of construction drawing, educational efficiency is achieved using modern graphic programs. Among the graphic programs designed for the field of architecture, ArchiCAD is particularly well-suited for covering the topics of the subject of construction drawing, and it is an effective way to bring the drawings to a three-dimensional state in front of the eyes of students in order to cover the essence of the subject. Therefore, the practical importance of graphic programs and their descriptions play a special role in covering the full essence of this subject.[1]

The use of the most modern technologies in the teaching process creates comfortable conditions for students and helps them develop independent thinking. Studying graphic programs not only improves drawing skills, but also develops students' technical knowledge. The importance and tasks of teaching graphic programs. Modern graphic programs are used as the main tool for creating drawings in the construction industry. The use of these programs in teaching provides students with the opportunity to develop projects in real time. During the training process, students have the opportunity to create not only traditional drawings, but also 3D modeling, visualization and animation.

The main tasks of teaching construction drawing are as follows:

• Improving graphic knowledge: Teaching students to create construction projects using drawings and images.

• Developing technical skills: Developing skills to quickly and efficiently create projects using modern graphic programs.

Developing creative thinking: Students learn to realize their creative ideas using 3D modeling and other graphic tools. The importance and tasks of teaching graphic programs. Teaching graphic programs, especially in the construction industry, is gaining importance with the development of modern technologies. With the help of these programs, it is easier to create, view, analyze and implement construction projects. In the process of teaching graphic

1 https://www.researchgate.net/publication/359362846_Qurilish_chizmachiligi_fanini_o'qitishda_talabalar_fazoviy_tasavvurini_grafik_dasturlar_asosida_rivojlantirish_metodikasini_takomillashtirish

programs, students are given the opportunity to develop not only technical knowledge, but also creative thinking, problem-solving and design skills.[2]

Adaptation to modern technologies: Many graphic programs currently used in the construction industry (AutoCAD, Revit, ArchiCAD, SketchUp, etc.) provide the ability to create, model and analyze projects in real time. Studying these programs helps to strengthen students' technical knowledge and prepares them for the modern construction industry. Effective creation and analysis of projects: With the help of graphic programs, students save time when creating construction projects. For example, with the help of 3D modeling and visualization programs, it is possible to see how the project will look before its completion. This, in turn, allows you to create drawings more accurately and correctly.

The importance of the problem of forming and developing spatial imagination is that many studies have been conducted in this area. In particular, Uzbek scientists R. Khorunov, Yu. Kyrgyzboyev, I. Rakhmonov, R. Ismatullaev, Sh. Murodov, T. Azimov, D. Kuchkarova, E. Ro'ziyev, P. Adilov, S. Saydaliyev, Sh. Abdurakhmonov, A. Hamrakulov and others; including scientific research conducted by foreign scientists such as I.P. Istomina, O.V. Razumova, L.V. Zanfirova, L.P. Rusinova, A.V. Piliper, Yu.A. Volkova, Ye.P. Benenson, N.S. Podkhodova, A.I. Khubiyev, L.N. Anisimov, X.A. Arustamov, A.D. Botvinnikov, A.V. Ivanov, I.Ya. Kaplunovich, Yu.F. Katkhanov, Ye.I. Korzinov, I.I. Kotov, M.N. Makarov, A.A. Pavlov, V.S. Stoletnev, V.I. Yakunin, P.A. Ostroykov, I.P. Kaloshin.[3]

Skills Development: Teaching graphics programs teaches students a variety of skills. Students develop not only a technical approach to creating drawings, but also creative thinking. With the help of graphics programs, it will be possible to more clearly express ideas about projects developed. Teaching students the basics of graphics and design: One of the main tasks of teaching graphics programs is to help students understand construction graphics and design. Teaching students how to create 2D and 3D drawings using graphics programs allows students to learn construction technologies in more depth. Technical Skills Development: One of the most important tasks of teaching graphics programs is to teach students the technical skills necessary to create drawings and models. Students learn to create drawings in the program, but also learn to make effective decisions during the project process.

[2] https://cyberleninka.ru/article/n/arxitektura-qurilish-chizmalarini-o-qitishda-grafik-dasturlardan-foydalanish-metodikasini-takomillashtirish/viewer
[3] https://scispace.com/pdf/qurilish-chizmachiligi-fanini-oqitishda-grafik-dasturlardan-1r9v1465.pdf

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House drawing drawn in Auto Cad program

Developing creative thinking: With the help of graphic programs, students have the opportunity to develop projects not only technically, but also creatively. These programs help students create their own designs, develop new ideas and express them visually. Developing a creative and analytical approach: Learning graphic programs helps students develop a creative and analytical approach to solving problems. When creating drawings, students are forced to consider different options, analyze them and choose the best option. This process, in turn, increases the analytical thinking skills of students. Solving real-world problems in the field of construction: By learning graphic programs, students learn not only to create drawings, but also to analyze various aspects of construction projects. For example, they learn to solve real-world problems by paying attention to the selection of building materials, strengthening structures, location and other factors. Automating the construction process: Learning graphic programs helps to automate construction processes. Students will have the opportunity to quickly and

efficiently create projects, analyze them, and view the results of projects in real time. This process allows you to create projects more efficiently and safely. Teaching graphics programs is very important for improving the knowledge and skills of students in the construction industry. With the help of these programs, students develop not only technical knowledge, but also creative and analytical thinking. In the process of studying graphics programs, students are given the necessary skills that ensure high efficiency in creating and analyzing construction projects. There are methodological approaches to using various graphics programs in teaching construction drawing. The selection of programs and their effective use in the teaching process is of great importance. AutoCAD: AutoCAD is a widely used program for creating construction and design drawings. With the help of AutoCAD, 2D and 3D drawings can be created. Teaching AutoCAD in teaching helps to provide students with technical knowledge. Revit: Revit is very effective in building data management and 3D modeling. In teaching, students are given the opportunity to manage construction projects, model them, and see the project process more fully and clearly using the Revit program. ArchiCAD: The ArchiCAD program is used to create architectural and design projects. Training in this program helps students create architectural structures, as well as create virtual models.

Methodology for using modern graphic programs. Modern graphic programs play an important role in creating, analyzing, and improving projects in the construction and architecture industries. With the help of graphic programs, it is possible to create 2D and 3D drawings, model, visualize, and develop animations, all of which serve to increase the effectiveness of the learning process. Methodological approaches used in teaching modern graphic programs help students develop not only technical knowledge, but also creative and analytical thinking. The main goal of teaching graphic programs is to teach students to effectively use modern technologies in creating construction and architectural projects. This methodology helps to develop students' technical knowledge, teach them innovative approaches, and increase creative thinking in the process of creating projects. The main objectives of the methodology for using graphics programs are as follows: Teaching students to create 2D and 3D drawings: Creating and visualizing drawings using graphics programs teaches students to move from traditional drawing to a modern, automated approach. Modeling and analyzing projects: By studying graphics programs, students are given the opportunity to model construction projects, analyze and optimize their various aspects.[4]

[4] https://journal.jdpu.uz/index.php/phys-tech/article/view/4990

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Developing a creative approach: Using modern graphic programs, students learn to create their own designs, develop new ideas, and express them graphically. Various methodological approaches are used in teaching modern graphic programs. Each of them helps students develop certain skills. Below are some of the main methodological approaches: Theoretical lessons and instructions: Initially, when studying graphic programs, students are given theoretical knowledge about the main functions and capabilities of the programs. These lessons are aimed at teaching how the program interface, tools, and elements work. Using this method, students are introduced to the basic concepts of the program.

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House drawing drawn in Auto Cad program

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Practical exercises: Practical exercises play a significant role in learning graphics programs. Students begin to apply theoretical knowledge in practice, create various design elements, and draw 2D and 3D drawings. With the help of exercises, students can be taught various functions and tools used in working with the program. Course projects: Students are given small course projects during their studies, in which they create a real-life construction or architectural project. This method provides students with the opportunity to apply their knowledge in real situations. Upon completion of the project, students submit a report on their work, which in turn requires analysis and updating. Teaching with the help of virtual and demonstration materials: Visually displaying 3D models and interactively viewing projects is an effective method for students. Displaying 3D models created using graphics programs using virtual reality (VR) technologies allows students to fully understand the projects. This approach helps students to learn the material in a more lively and interesting way. Brief information about some popular programs used in the process of learning graphics programs and their methodological application: AutoCAD: AutoCAD is the most widely used 2D and 3D drawing program, which is used to create construction and architectural projects. The methodological approach to teaching students how to create drawings using the program is as follows: first, the basic tools are explained, and then practical exercises are organized so that students can work independently with them. When teaching AutoCAD, step-by-step instructions are given so that the student learns how to create drawings in the program. Revit: Revit is used for construction data management and 3D modeling. Students need to be explained the process of creating and modeling building elements in Revit from an initial technical point of view. Students are given interactive exercises, practices through modeling various structures and buildings. ArchiCAD: ArchiCAD is widely used in the field of architecture. In teaching, students learn to model, plan and place buildings using this program. Students are taught to interactively create various projects using the program, place structures and their elements. SketchUp: SketchUp is a 3D modeling program that allows you to create various models in architecture, design and other fields. It is based on the methodology of teaching students simple and fast approaches to creating projects in the SketchUp program. With the help of this program, students will have the opportunity to create, optimize and view 3D models. Some aspects that should be paid attention to when teaching graphic programs: Creating comfortable conditions for students: To learn graphic programs, it is necessary to provide students with the necessary technical tools, computers and programs. The effectiveness of practical training: During practical training, students should be given various tasks, encouraged to work independently, and helped to

complete projects. Use of new technologies: It is necessary to create more effective teaching opportunities for students by teaching new technologies in the program, for example, using 3D visualization and virtual reality (VR) tools. Modern graphic software teaching methods help students not only create drawings, but also develop creative thinking. Effective use of programs provides students with solid knowledge in creating and analyzing construction and architectural projects. The use of modern methodological approaches in the process of studying graphic programs develops students' knowledge and skills, preparing them for successful work in the professional field. When teaching graphic programs, it is necessary to provide students with theoretical knowledge as well as practical training. Methodological approaches in the teaching process are implemented in the following forms: Teaching using textbooks and manuals: Special textbooks and manuals should be developed for each program. These guides help students learn how to use the programs. Practical exercises: Students consolidate their knowledge by performing various tasks in graphics programs, creating drawings, and performing 3D modeling. Course projects: Students are given the task of studying and creating real-life construction projects. This methodology helps students understand the real problems of the construction industry. Teaching methods and practical exercises. Choosing effective teaching methods in teaching modern graphics programs is important in providing students with not only technical knowledge, but also creative thinking and analytical skills. Teaching graphics programs involves not only learning software tools, but also preparing students to create, analyze projects, and successfully implement them. Therefore, the correct organization of teaching methods and practical exercises significantly improves the process of student learning. The methods used in teaching graphics programs make the student's learning process active and effective. The main teaching methods are listed below:

CONCLUSION

Teaching construction drawing using modern graphic programs is a very important and effective process for students. These programs not only teach how to create drawings, but also develop creative and technical approaches in students when creating construction projects. Methodological approaches used in teaching programs such as AutoCAD, Revit, ArchiCAD help prepare students for the modern world of construction. The use of various methodological methods in the teaching process creates the opportunity to fully develop students' skills.

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