

**IRSTI 06.81.23****Improving the methodology of using convenient functional capabilities of graphic programs in the science of construction drawing***Sanjar Mardov**Tashkent State Pedagogical University named after Nizami**Tashkent, Uzbekstan**E-mail: sanjar.mardov@mail.ru*

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**Abstract:** *Electronic form of assessment of students' knowledge in the field of construction drawing in higher education.*

**Keywords:** *construction, independent learning, test, drawing, computer graphics, graphics software, construction drawing.*

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The current advances in science and technology have changed the requirements for graphic training of university students. The technology of teaching graphic sciences has developed significantly. The modern educational space is filled with the latest software and multimedia graphics packages and complexes. One of the main requirements for student competencies in the curriculum is the acquisition of computer graphics. Therefore, today there is a need to improve the teaching of graphic sciences, especially construction drawing.

Yu.F. Katkhanova notes: "The high pace of development of computer technology leads to a natural reassessment of the attitude not only to the existing knowledge system, but also to the search for new ways to improve traditional teaching methods and techniques."

The difference between methodology and technology can be explained as follows:

- methodology, in our opinion, is the content of education aimed at the goals of teaching, a joint set of teaching organization. Methods, techniques, and methods or methodological systems that have the same content can produce two different outcomes for two teachers;

- when using pedagogical technology, different teachers can achieve the same results, even if they use different approaches, different tools and methods.

Learning technology is a means of teaching in which the primary function of the task is to perform the task with the help of human management. In educational technology, the focus is on teaching aids: the educator does not teach students, but directs them to activities, acts as an incentive, and manages the educational tool. The teacher's pedagogical skills include the selection of relevant content, the use of effective teaching methods and tools in accordance with the program and pedagogical objectives.

According to L.O. Mokresova, the use of innovative forms of education in the teaching of graphic sciences: teaching students to make product drawings using computer graphics, reading video lectures with the help of multimedia equipment, teaching science on electronic media for independent study. It is connected with the creation of a methodological fund, the use of existing methodological resources through the conversion of the main methodological developments of the department into electronic form, and others.

According to S.A. Freiberg, the search for answers to the traditional question of didactics determines the results of the search for teaching methods. But the teaching method is complex, multidimensional, and there are no "pure" methods. In any educational process, several methods are involved at the same time, complementing and interchanging.

Based on the analysis of L.V. Pavlova's experience of innovative teaching methods, the quality of learning materials in engineering and computer graphics depends on different teaching

methods, for example, associative-cooperative method and descriptive analogy method increase the success of teaching. The purpose of these methods is to develop spatial imagination, the formation of creative, cognitive and engineering-design maturity of students.

Researcher T.V. Chernyakova, using the model teaching methodology of the subject "Computer Graphics", identified the level of teaching methods, all components, ie scientific advice, their interrelationships, principles, methods, tools and forms, and developed scientific recommendations for teaching science. This model provides psychological and pedagogical training of students in the teaching of "Computer Graphics" to university students, the need to master the subject, to determine the level of interest in science on the basis of levels, methods, tools and forms.

According to J.J. Djanabaev, it is necessary to accelerate the educational process, purposeful information preparation and computerization. The use of new pedagogical technologies in teaching, computerization, provides the basis for accelerating the learning process.

All teaching methods have their strengths and weaknesses, so they need to be used in harmony, depending on the purpose, the circumstances, and the time available. The quality of education is the sum of the quality of teaching and upbringing.

Yu.K. Babansky highlights the 7-step algorithm of "effective choice of teaching methods":

1. Decide whether the material will be mastered independently or under the guidance of a teacher. If the student is able to study the material independently and deeply enough without extra time and effort, the teacher's help will be superfluous.

2. Determining the compatibility of reproductive and productive methods. If conditions allow, attention will be paid to productive methods.

3. Determining the compatibility of inductive and deductive logic, analytical and synthetic ways of knowing. If an empirical basis for deduction and analysis has been developed, deductive and synthetic methods are fully suitable for adults.

4. Measures and means of compliance with oral, visual, practical methods.

5. Address the need to introduce incentive methods for students.

6. Methods of control and self-control, interval, definition of "points".

7. Develop resource options for deviations from the planned learning process.

We agree with Ye.Yu. Jokhova, taking into account the conditions of teaching engineering computer graphics, the time allocated to science and the specifics of graphics programs. In her research, Ye.Yu. Jokhova cites the peculiarities of computer-assisted teaching methods. According to the author, there are four main types of computer-assisted learning: - demonstration explanation; - reproductive; - problematic; - research methods can be used.

The reproductive method of teaching using computer technology allows the teacher and the computer to master the knowledge transmitted to the student and to increase the material studied and apply it in similar situations, to organize the activities of the student. The use of this method with the help of a computer can significantly improve the quality of the organization of the educational process, but it does not allow to radically change the educational process compared to the traditional scheme (without a computer). The use of problem and research methods in this regard is more reasonable.

There are two main types of cognition: verbal, speech-based, and visual. Some students have a tendency to accept verbal information, while others are required to convey information through images. At such times, it may be helpful to combine the two into a series of lectures. The demonstration method is a continuation of the historically established method of transmitting the experience of the older generation to the younger generation, which is based on the "do as I do" rule. Modern interpretations of this method include visual representations of events, processes, problem-solving methods, and ways to use a variety of tools. Demonstration does not involve unconsciously copying certain actions that lead to the

desired result, but is one of the components in getting your opinion on the topic being studied. According to L.B. Grigorevsky, there are not enough textbooks and manuals on the subject of engineering computer graphics, which is one of the disciplines of engineering graphics, so lectures are one of the most important and basic means of conveying information to students. In addition, the teacher provides information on the new course in the form of separate topics and sections, which the student should collect from various sources.

The visual organization of the learning process in construction drawing also leads to the comprehension of the demonstration learning materials, their conscious and thorough mastery, and the stabilization of attention. Demonstration materials should be appropriate to the type and topic of the lesson, appropriate to the student's age and level of knowledge, and their use should be organized using effective methods and tools. Visual aids in Construction Drawing can vary depending on the type of lesson and the topic. Including:

- Printed materials (posters, handouts, etc.).
- Materials in electronic form (presentations, forms, pictures, etc.).
- Animated materials (multimedia e-books, e-textbooks, etc.).
- Virtual models (details, house models, machine mechanisms and models).

You can use ArchiCAD, AutoCAD, 3ds Max, Revit, Sketchup to create virtual object models. Because these programs are designed for computer modeling. For teachers of construction drawing, it is recommended to create mainly in ArchiCAD. First of all, the ArchiCAD program is adapted to international standards and provides all-round convenience for the teacher. Second, the program is designed to work in accordance with the rules of the construction industry.

The visual model of the virtual model of the created object, that is, in terms of design, has a wide range of possibilities in the graphics program ArchiCAD itself, in which the material and color of the building is much more convenient than other graphics

programs. The reason is that in the process of creating a model of the building, the program itself offers standard materials in accordance with the building components. This brings a number of conveniences to students. ArchiCAD has many advantages in working with virtual building models, making it interesting and understandable for the user.

MS Word, PhotoShop, CorelDraw can be used to make posters. It is recommended that construction design teachers use MS Word and PhotoShop. It is convenient for teachers to enter and design texts using MS Word. PhotoShop has the ability to process and design images.

MS Word, ArchiCAD, Revit, Paint NET can be used to prepare handouts. With the help of these programs, teachers have the opportunity to design the text, graphic assignments and drawings required for the handout, the quality of which is based on modern requirements.

Multimedia lesson plans can be created using Adobe Flash, ArchiCAD, Snagit. Adobe Flash is one of the most convenient programs for animating various drawings and tasks in the field of construction drawing. ArchiCAD helps you create building facades, building models, and view them from different angles, trim, color, and more. The Snagit program is designed to videotape the process on a computer screen. With the help of Snagit video recording of all activities performed in the ArchiCAD graphics program and its widespread use in all types of educational process, it is possible to set a high level of mastery of students.

In today's world of technology, there are e-books, textbooks, manuals, and more. They are mostly verbal and serve as a source of information for users. There is a need to create a multimedia e-book on the subject of construction drawing. In this case, the study of theoretical information on the subject will give students a clear idea of the graphic drawings in the form of animation. Based on this, it is possible to perform the tasks correctly based on this knowledge in the process of performing graphic tasks. If you encounter a problem while completing a graphic task, you can use problem-solving examples on the topics in the task set section of the multimedia e-

book. The advantage of this is that when faced with a problem in the execution sequence, it is possible to have a clear understanding by going back.

The e-textbook covers the didactic cycle of the whole educational process: theoretical data, animation of problem-solving sequences, use in the educational process, control of the level of knowledge and the availability of information retrieval system. differs from other textbooks.

The use of color computer animation allows you to control the process of extracting and presenting the necessary information, high-quality graphics, video fragments, schemes, formulas, the subjects of the studied subject are presented in a series of presentations or connected in the form of a branched dynamic chain.

Video tutorials can be a positive solution to these problems. Students can download video lessons on computers, tablets and smartphones. This allows students to repeat the lesson as many times as they want (that is, until they have mastered it). This will ensure that the student's learning is at the required level.

Students should be able to draw and read drawings, graphs, and shapes in the technical sciences. This requires a good set of assignments. The need to redesign a set of quality graphic assignments is pending. To find an optimal solution to this problem, it is necessary to create an electronic version of a set of graphic tasks in science.

Level Graphic Task - Develop students' graphic assignments from simple to complex.

M. Sroka, B. Radovan, T. Jelena, H. Stachel, Zongyi Zuo, Kaiping Feng, Bing Chen, J.J. Djanabaev, A.K. Hamrakulov, N.D. Yadgorov, D.S. Saidakhmedova, A.A. Kakhkharov, D.Sh. Dilshodbekov and others, T.S. Borichevsky, V.P. Matanov, L.M. Pyjevich, P. Odilov, A. Ashirboev, T. Rixsiboev, A. Valiev gave scientific recommendations on creation of graphic tasks.

P.V. Zelyonyy and Ye.I. Belyakova developed a set of tasks on engineering graphics, focusing mainly on the department of descriptive geometry. In addition, graphic tasks are not divided into levels of complexity.

P.V. Zelyonyy and Ye.I. Belyakova developed a set of tasks from engineering graphics to projection drawing. They are also presented in the form of colored details, as well as isometric (clear) images. But the principle of simple to complex is not taken into account.

Written by K.A. Volkhinym, P.V. Ilyushenko these options are available. But the tasks are not divided into levels of complexity.

The science of computer graphics, which is being studied today as part of the science of construction drawing, has such opportunities that it greatly contributes to the quality of the set of tasks being created in a short period of time. One of the best ways to handle this is to use ArchiCAD graphics software. This program makes it easier to develop science assignments than other programs.

Now let's look at the order in which a practical exercise is conducted.

The first phase of the training includes: the interfaces and basic toolbars of the ArchiCAD graphics program, which are related to the construction industry; coordinate systems; two- and three-dimensional drawing environments are re-explained and demonstrated to students using the comparison method. Students will be introduced to the graphics program. They try to understand the similarities and differences between the program's interface, toolbars, and commands. The teacher teaches the students, the students practice on the computer.

For example: Explain the choice of two-dimensional or three-dimensional media in applications. When you start ArchiCAD, you can select a two- or three-dimensional environment from the Info menu, or you can switch from the keyboard to the two-dimensional or three-dimensional state using the F2 and F3 keys. ArchiCAD software allows you to change the environment at any time (Figure 1).

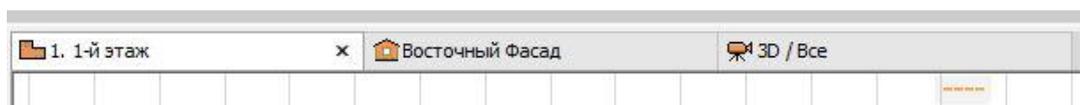


Figure 1: Selecting a working environment in ArchiCAD

The second stage of the practical training includes: drawing two-dimensional (flat) drawings of different complexity; sizing; change line types, colors, and thicknesses; adjust the drawing font; drawing and saving graphics are taught by comparing the hardware and commands of graphics programs. The teacher shows an example and the students repeat it in a graphic program. Once the teacher has completed the sample, students will be able to complete a simple task on their own.

For example: explain how to do a three-room project work drawing.

The teacher will explain this task in ArchiCAD, which is one of the most convenient programs for the construction industry. Students follow the teacher's instructions on the computer one by one. In ArchiCAD, you can draw arrows (anywhere on the Constructions toolbar) using the Grid axis command to draw. The outer and inner walls of the project work on the arrows (using the command "Wall" in the toolbar "Construction") are drawn. Before drawing, the wall thicknesses and heights are adjusted by entering the dialog parameter command of the Wall command. When straightened, the outer and inner walls are drawn along the given axes. When the walls are finished, the frames and doors open. The frame and door are opened by the "Door" and "Window" commands in the "Constructions" panel.

In the third phase of the workshop, students will be taught how to build and trim three-dimensional virtual models of a building based on a drawing history by comparing the equipment and commands of graphics programs. The teacher shows an example and the students repeat it in a graphic program. Once the teacher has completed the sample, students will be able to complete a simple task on their own.

At the final stage of the practical training: the task is to create a clear picture of the project work. One of the advantages and disadvantages of the ArchiCAD graphics program is that it allows you to draw a clear image while drawing a two-dimensional drawing. The teacher does not take the time to draw a clear picture.

Spends extra time simply making the necessary changes to the image.

Graphics programs allow students to expand and enrich their knowledge. In addition, students will be able to independently master the program by identifying the strengths and weaknesses, similarities and differences of the programs. The method used develops students' motivation to learn the subject and teaches them to compare other design programs in the modern graphics software market. In this way, they will be able to choose the most appropriate program for their activities.

### References

1. S.X. Mardov., Z.X. Farxatova. (2022). The practical significance of design and its types. Euro-Asia Conferences.
2. S.X. Mardov, Z.X. Farxatova. (2022). Design and art. Euro-Asia Conferences. P. 58–61.
3. S.X. Mardov, M.N. Khasanova, E. Absalomov. (2022). Pedagogical and psychological basis of teaching architecture drawing in types of education. Euro-Asia Conferences. P. 32–35.
4. S.X. Mardov. (2021). The practical importance of graphic programs and their descriptions in the development of student space imagination in teaching the subject of construction drawing. ISJ Theoretical & Applied Science, 12 (104). P. 680-684.
5. S.X. Mardov., R.S. Feruza, N.A. Xasanboy o'g'li. (2021). Evristic teaching technology and its practical application which in theaching of draftsmanship. Middle European Scientific Bulletin, 12. P. 458-462.
6. S.X. Mardov. (2021). The status of teaching the subject "construction drawing" in higher education institutions. Archive of Conferences. P. 105-108.
7. S.X. Mardov., F.Z. Xikmat. (2021). Content of the Science of Architecture Construction and Its Current Status of Teaching. International Journal of Innovative Analyses and Emerging Technology, 1(7). P. 106–114.
8. S.X. Mardov, F.Z. Hikmat Qizi. (2021). "Methods of using graphic programs in the field of construction drawing." ACADEMICIA: An International Multidisciplinary Research Journal. 11.10. P. 1297-1306.

9. S.X. Mardov. (2021). Qurilish chizmachiligi fanini o'qitishda grafik dasturlardan foydalanishda talabalarning fazoviy tasavvurini rivojlantirishning bugungi holati va muammolari, *Общество и инновации*, 2.12/S. P. 146-154.

10. S.X. Mardov. (2021). Modern Electronic Methods of Controlling Students' Knowledge in the Field of Construction Drawing Online-conferences platform. P. 18-26.

11. S.X. Mardov, F.S. Rasulova, S.H. Galimova. (2022). The Importance of Graphic Programs in Developing Student Space Imagination in Teaching Construction Drawing. *European journal of innovation in nonformal education*. 2,2. P. 320-325.

12. S.X. Mardov, F.Z. Xikmat. (2022). Methodology of Development On The Basis Of Graphic Programs in Increasing Student Space Imagination and Graphic Literacy in Teaching Construction Drawing. *European journal of innovation in nonformal education*. 2,2. P. 312-319.

13. S.X. Mardov. (2022). Current status and problems of students'spatial imagination development when using graphic programs in teaching the science of construction drawing. *Berlin Studies Transnational Journal of Science and Humanities*. 2,1.5.

14. S.X. Mardov. (2021). Current Status of Developing Students' Space Imagination in the Use of Graphic Software in Teaching Architectural Drawings, "International Journal of Advanced Research in Science, Engineering and Technology". 8.10.

15. S.X. Mardov, (2022). Qurilish chizmachiligi fanini o'qitishda grafik dasturlardan foydalanishda talabalarning fazoviy tasavvurini rivojlantirishning bugungi holati va muammolari. *Жамият ва инновациялар*, 3(1). P. 155–163.

16. S.X. Mardov, M. Hamroqulova, E. Nurmatov. (2022). Qurilish chizmachiligi fanini o'qitishda talabalar fazoviy tasavvurini grafik dasturlar asosida rivojlantirish metodikasini takomillashtirish. 3(1). P. 180–190.

**Қўрылыс сызу ғылымында графикалық  
бағдарламалардың ыңғайлы функционалдық  
мүмкіндіктерін пайдалану әдістемесін  
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**Аңдатпа:** Жогары оқу орындарындағы құрылыс сызбасы саласындағы студенттердің білімін бағалаудың электрондық нысаны.

**Түйін сөздер:** Құрылыс, өзін-өзі оқыту, тест, сурет салу, компьютерлік графика, графикалық бағдарламалық қамтамасыз ету, құрылыс сызбасы.

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## Совершенствование методологии использования удобного функционала графических программ в науке строительного черчения

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**Аннотация:** электронная форма оценки знаний студентов в области строительного черчения в высшем учебных заведениях.

**Ключевые слова:** строительство, самообучение, тест, рисование, компьютерная графика, графическое программное обеспечение, строительная схема.

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## Использованная литература

1. С.Х. Мардов. З.Х. Фархатова. (2022). The practical significance of design and its types. Евро-Азиатские Конференции.

2. С.Х. Мардов, З.Х. Фархатова. (2022). Дизайн и искусство. Евро-Азиатские Конференции. С. 58–61.
3. С.Х. Мардов, М.Н. Хасанова, Э.И. Абсаломов. (2022). Педагогические и психологические основы обучения архитектурные чертежи в советы по образованию. Конференции. С. 32–35.
4. С.Х. Мардов. (2021). The practical importance of graphic programmes and their descriptions in the development of student space imagination in teaching the subject of construction drawing. ISJ Theoretical & Applied Science. 12 (104). С. 680-684.
5. С.Х. Мардов, П.Ф. Саидахатова, Н.А. Хасанбой угли. (2021). Эвристическая технология обучения и практическое применение который в обучении черчению. Среднеевропейский научный бюллетень. 12. Р. 458-462.
6. С.Х. Мардов. (2021). The status of teaching the subject "Construction drawing" в Higher education institutions. Архив конференций. С. 105-108.
7. С.Х. Мардов (2021). Content of the science of architecture construction and its current status of teaching. international journal of innovative analyses and emerging technology. 1 (7). С. 106–114.
8. С.Х. Мардов, З.Ф. Хархатова. (2021). "Методы использования графических программ в области построения чертежей" *Academicia: Международный журнал междисциплинарных исследований* 11.10. С. 1297-1306.
9. С.Х. Мардов. (2021). Современное состояние и проблемы развития пространственного воображения учащихся при использовании графических программ в развитии дисциплины строительного черчения, общие и инновационные. 2.12. С. 146-154.
10. С.Х. Мардов. (2021). Современные методы управления электроникой студенты знают в поле конструктивного рисования. Онлайн-конференции. Платформы. С. 18-26.
11. S.X. Mardov, F.S. Rasulova, S.S. Galimova. (2022). The Importance of Graphic programmes in Developing Student Space Imagination in Teaching Construction Drawing *European journal of innovation in nonformal education*. Р. 320-325.
12. С.Х. Мардов, С.К. Фархатова, Зилолахон Хикмет. (2022). Методология развития на основе графических программ в Повышение пространственного воображения учащихся и графической грамотности при обучении строительному черчению.

Европейский журнал инноваций в неформальном образовании. 2, 2. С. 312-319.

13. С.Х. Мардов. (2022). Текущий статус и проблемы из studentspatial imagination development когда использование графических программ в обучении наука о построении чертежей. Berlin Studies Transnational Journal of Science and Humanities. 2,1.5. Педагогические науки.

14. С.Х. Мардов. (2021). Текущий статус студентовразработчиков в использовании графического программного обеспечения в учебных архитектурных чертежах. "Международный журнал передовых исследований в науке, технике и технологиях". 8.10.

15. С.Х. Мардов. (2022). Современное состояние и проблемы развития пространственного воображения учащихся при использовании графических программ в преподавании предмета строительный чертёж. Общество и инновации, 3(1). С. 155–163.

16. С.Х. Мардов, М. Хамрокулова, Э. Нурматов. (2022). Совершенствование методики развития пространственного воображения учащихся на основе графических программ при преподавании предмета строительный чертёж. Общество и инновации. 3(1). С. 180–190.