METHODOLOGY OF USING GRAPHIC PROGRAMS FOR IMPROVING DESIGN THINKING OF FUTURE ENGINEERS-BUILDERS IN THE PROCESS OF GRAPHIC EDUCATION

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Abstract *- in the process of graphic education at the institution of higher education, it is aimed at forming the graphic culture of future engineers-builders, as well as the creative potential of the individual. There are many effective works on this front, especially in the teaching of construction drawing, educational efficiency is achieved using modern graphic software. The BIM program is particularly perfect among the graphic programs for the field of architecture in explaining the topics of construction drawing, and it is an effective way to change the three-dimensional state of the drawings in front of the eyes of the students. For this reason, the use of graphic programs and their descriptions take a special place in elucidating the full essence of this science.*

Key words *- graphic education, construction drawing, graphic programs, graphics, information and communication, design thinking, spatial imagination, architecture, drawing, didactics, engineering graphics.*

In the Strategy of Actions on the five priority directions of the development of the Republic of Uzbekistan, the priority task of "further improvement of the continuing education system, increasing the possibilities of quality education services, continuing the policy of training highly qualified personnel in accordance with the modern needs of the labor market" is defined. In the implementation of this task, higher educational institutions in the field of architecture develop the design skills of future engineers-builders.

The widespread use of computers by future engineers-builders will serve to accelerate scientific and technical progress in society and, on this basis, to achieve socio-economic development. Introducing modern forms and methods of teaching, computer and information and communication technologies into the educational process, providing higher education institutions with modern educational and laboratory equipment and educational and methodological literature, scientific research and represents the need to implement important tasks such as supporting and encouraging innovation activities, taking measures to organize and develop

modern scientific laboratories of higher education institutions, training competitive personnel and being able to demonstrate their professional mobility and creativity.

Computerization of all spheres of human activity has led to the change of centuries-old pedagogical technologies. New means of teaching forced to reconsider the main issues of pedagogy: who should be taught in the higher education system at the current stage of society's development, what should be the content of education, how should higher education serve as a basis for training specialists. forms and methods should be used.

Taking into account the above, we believe that revision of the content of the subject of engineering computer graphics is one of the urgent problems in teaching this subject. It is appropriate to take into account the achievements of today's science and technology fields when reorganizing the content of engineering computer graphics.

The analysis of studies focused on the problems of teaching principles allows to distinguish didactic principles common to all subjects. All researchers agree on the nomenclature of didactic principles. But the content of these principles is interpreted differently. Such principles include:

- the principle of education and training;
- the principle of connection between theory and practice;
- principle of scientificity;
- the principle of comprehensibility;
– the principle of compatibility and consistency;
- the principle of consciousness and creative activity;
- the principle of demonstrability;
- the principle of the strength of educational results and the development of cognitive abilities;
- taking into account the individual characteristics of learners and the principle of collectivity of education;
- the principle of positive emotionality of education;
- the principle of improving the process of graphic education in the development of design thinking in future engineer-builders.

If we divide the content and procedural sides of education into two, then traditional didactic principles can be conditionally divided into these two groups. The conditionality of the separation of didactic principles in this way is classified by their interrelationship and interdependence.

As an example, we cite the conditionality of separating education, education and development processes.

The content principles of education include:
- principle of scientificity;
- the principle of comprehensibility;
- principle of consistency;
- the principle of continuity;
- the principle of integrity;
- the principle of connection between theory and practice;
- the principle of continuity. Principles of content selection:

Scientific principle. M.D. Dammer showed the development of the content of the scientific principle. According to the results of research, the content of this principle was first expressed in 1950 by M.N.Skatkin in the form of eight requirements:

1) scientific reliability of information delivered to students;
2) reveal the nature of the described events;
3) show events in their interdependence;
4) show the development of events and the sharp nature of this development;
5) to introduce learners to the most important theories that correctly explain phenomena dialectically and materialistically;
6) to create correct ideas about knowledge of the world and the power of the human mind in learners;
7) to create correct opinions about absolute and relative truth in students;
8) introducing students to scientific research methods.

We agree with the opinion of Z.K.Meretukova and A.R.Chinazirova. “The principle of scientificity in education should take into account the fact that there is “scientific pluralism” in the component of education. “A different approach to one scientific problem increases the scope of thinking of students and encourages them to search for the truth,” they say.

G. M. Chernobelska's views can be understood from the last words of her quote: “Scientific content is achieved not only by providing students with ready-made knowledge, but also by introducing them to scientific research methods.”

The principle of comprehensibility. The most important principle of teaching is the principle of comprehensibility. When learning new material, students face difficulties related to the information content, and secondly, the way it is presented. The first type of difficulties is related to the student's thesaurus. That is, the student's understanding of the world is related to the system of interconnected imaginations. Such difficulties are called the thesaurus information barrier. All students have

different thesauruses, and the information barrier that one student faces does not mean that another student will also face it.

The principle of comprehensibility in higher education was studied in the works of O. V. Romanova. Examining the impact of the new information environment on the educational process, the author notes that the educational process "must take into account the fact that students receive a large amount of information from the global information field and independently. The traditional structure of the principle is expanding. The information that students receive and turn into knowledge should be undoubtedly scientific, so students should be able to distinguish real scientific knowledge from pseudo-scientific knowledge."

The principle of connection between theory and practice. "This principle is based on the following rules: students' own social experience should be taken into account in teaching practice; directing the educational process to solve important problems for students (social, economic, environmental, political); the close relationship between education and industrial labor in the national economy; mass media, periodical materials".

The principle of consistency. Ye. V. Eliseeva believes that the leading principle of content selection in modern conditions should be the principle of consistency: "provides the appearance of a pedagogically based system of interrelated educational information." The principle of consistency requires the developer of the content to include in the content of the subject educational knowledge that is included in all conceptual systems of this subject and illuminates its essence.

Principles of content creation:

The principle of continuity. I.P. Podlasiy "educational process consists of separate steps, if it continues without interruptions, without disruption of continuity, without uncontrollable situations, it achieves more success. "If skills are not practiced regularly, they will disappear," he writes.

The principle of integrity. The concepts of the principles of continuity and coherence are explained in "Didactics" by L.V. Zagrekova and V.V. Nikolina: The principles of continuity and coherence require that the content of the educational material be presented in a certain sequence and in a logical relationship in the system. In this case, the information relies on the previous one and prepares to absorb new information.

The principle of continuity. The principles considered for creating educational content are closely related to the principle of continuity, which guides content developers to consider interdepartmental and interdisciplinary relationships. "The

overabundance of interdisciplinarity, which has filled the educational environment, has increased the demand for pedagogues."

In order to bring the education of subjects in the field of architecture construction to the level of modern requirements, collecting information on the subjects specified in the subject program and processing them with the help of multimedia computer technologies is an urgent issue of today. The use of modern computer technologies in the educational process should be carried out in parallel without denying pedagogical technologies. After all, such an approach gives the expected result in the effective assimilation of graphic materials. It is no exaggeration to say that the use of graphic programs is the only way to the expected result, especially in the teaching of construction drawing. The name of the subject itself requires teaching with the help of graphic programs. Until now, the lack of teachers who know graphic programs and the lack of educational facilities were the main reasons for not carrying out construction drawing in harmony with graphic programs. However, in today's advanced age, the organization of lessons without using graphic programs does not correspond to modern educational standards.

One of the urgent tasks of today is to connect the topics in teaching the science of "Construction drawing", to ensure their coherence, and to use the most modern methods and tools of teaching. All subjects of the studied science serve as a foundation for each other. This requires the teacher to constantly work on himself, because construction drawing keeps pace with changes. Initially, the training of teachers who meet these requirements is another important urgent problem.

In teaching the subject of "Construction Drawing", it is necessary to summarize and analyze the information related to the subjects in the development of the subject program based on the curriculum.

Using the rich possibilities of modern computer technologies, it is necessary to redraw drawings, give them animations, and make them multimedia. Especially, as a result of drawing students' attention in a multimedia form, their attitude towards science changes. In addition, students will have the opportunity to get more detailed information about this drawing. If modern software tools related to computer graphics, ArchiCAD, AutoCAD, 3dMax and other programs serve as an assistant for the teacher in teaching science, for students who are acquiring knowledge, they help to understand the meaning of science, spatial imagination, creative and leads to the development of logical thinking skills, improvement of the rate of mastery of science. It is advisable to use computer graphics in processing the collected data.

Computer graphics are complex synthetic resources. It emerged and developed as a result of combining graphics with modern equipment and technological solutions that help the engineer to implement innovative ideas.

Three-dimensional modeling is a journey into the world that embodies the designer's ideas on the computer screen in amazingly realistic and convincing images. Just like if you reach out your hand, you can touch something that only existed in your imagination.

In 3D modeling systems, a three-dimensional model is usually displayed on the monitor screen as an arbitrary parallel projection (axonometry). Standard views are displayed in the appropriate panel and include orthogonal and standard isometric projections. T-VIEW and T-DRAW commands are used to automatically create orthogonal projections from a 3D model. In this way, the task of constructing its geometric image on the plane (on the monitor screen) based on the direct, spatial body (3D model) of the drawing geometry is performed.

The structural structure of geometric modeling includes the following 4 components:

1. Original copy or object of modeling. In three-dimensional space modeling, orthogonal projections, axonometry, perspective and numbered projections are obtained on the monitor screen. In addition, modeling objects can be multidimensional and non-linear models, which is a relevant and still unsolved problem for any other modern science.

2. The model space is the carrier of the model being described. Usually, this is a monitor screen, but other methods can be used to represent the model.

3. The modeling apparatus determines the methods of rendering 3D models.

They are:

- analytical;
- kinematic;
- constructive;
- parameterized;
- mixed methods.

4. Models are divided into frame, surface and solid state models.

Video presentation of a 3D drawing created with the help of computer graphics programs shows it in real life in front of students' eyes and is understandable for students and develops their spatial imagination. The reason is that the development of spatial imagination in students leads to the understanding of science. After all, spatial perception plays an important role in mastering construction drawing

materials. Therefore, a student can complete tasks in science only if he has spatial vision.

Modeling capabilities are expanded in BIM programs, and it is convenient to create building models. The use of images, views, cuts, stairs, roof coverings, nodes, constructions, estimate work and similar topics in the illumination leads to the development of students' spatial imagination and creative thinking skills.

A science teacher can create subject-related project works in BIM programs and use them in the course of the lesson. Using the wide range of BIM programs, you can view the created models from different angles, crop them, change the color of the model, automatically resize them, and more.

The main requirement is that the teacher should know computer graphics, that is, he should choose graphic programs according to the content and essence of the given material, level of complexity, and didactic tasks.

We are a student of construction drawing:

- history of computer graphics;
- departments of computer graphics;
- systems (CAD, CAM, CAE) that make up the department of design graphics;
- graphic programs working in the CAD system and their working principles;
- electronic image formats;
- equipment panels used for drawing;
- should know the algorithms for drawing the object based on its spatial position;
- analysis of the panel of equipment designed for creating two- and three-dimensional graphics;
- draw a two-dimensional drawing of a given three-dimensional detail;
- building a three-dimensional model of a detail based on a two-dimensional drawing;
- determination of optimal algorithms for designing geometric models in plane and space;
- creating complex drawings and shapes in plane and space;
- must have drawing and printing skills;
- analysis of objects with a complex shape;
- comparison of manual drawing (using drawing tools) and CAD software;
- mutual comparison of two or more CAD programs;
- to identify the similar and different aspects of CAD programs;
- we believe that they should have the skills to independently master new CAD programs.

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