

THE ROLE AND IMPORTANCE OF GRAPHIC SCIENCES IN THE TRAINING OF COMPETITIVE ENGINEERS

Qahharov Abduraxim Abdubannaevich¹
Jamalov Bakhriddinhuja Ismoilovich²

Abstract

The article describes the importance, tasks and role of the subject "Descriptive Geometry and Engineering Graphics" in the training of competitive personnel in higher education, the role, stages, tools, methods and techniques of developing students' spatial imagination in the organization of education.

Keywords: graphic geometry and engineering graphics, spatial imagination, multimedia e-textbook, multimedia e-book, intellectual computer games, virtual detail models, video tutorials, set of assignments, level tests.



¹ Namangan Engineering Construction Institute, Republic of Uzbekistan, Namanagan city, 12 Islam Karimov street, Uzbekistan

E-mail: a.a.qahharov@mail.ru

² Namangan Engineering Construction Institute, Republic of Uzbekistan, Namanagan city, 12 Islam Karimov street, Uzbekistan

E-mail: b-i-jamalov@mail.ru,

INTRODUCTION

We need to intensify efforts to create equal opportunities for higher education. Therefore, our important task is to increase the coverage of graduates with higher education in our country to 20% in 2019 and in the coming years.¹ Today, the focus on higher education is rising to the level of public policy, and the system of teaching students in higher education is changing in line with modern requirements.

As part of the reform of the education system in Uzbekistan, the concept of development of higher education until 2030 includes "accelerating the process of studying and implementing best international practices to improve the quality of education and improving teaching methods" [1], training competitive personnel and their worthy contribution to economic development. As a result of reforms in the system, great attention is paid to the inclusion of higher education institutions in the list of the top 1000 higher education institutions in the ranking of internationally recognized organizations. The Action Strategy for the further development of the Republic of Uzbekistan for 2017-2021 sets the priority "improving the quality and efficiency of higher education institutions on the basis of the introduction of international standards for assessing the quality of education and training." It follows that it is important to use modern methods of teaching based on multimedia computer technologies in research work in the higher education system.

Opportunities for higher education have been significantly expanded through the opening of new fields of study and an increase in admission quotas².

It is known that the science of descriptive geometry and engineering graphics in the block of general engineering sciences is a science that requires logical, creative thinking skills and spatial imagination and thinking. Therefore, the organization of teaching in higher education institutions on the basis of modern computer technology is one of the requirements of the times. Engineers, technologists, who are trained for all sectors of the economy, need to be mature in all respects, both morally and professionally. One of the most pressing issues today is the organization of classes for students admitted to higher educational institutions with the use of modern computer technology and multimedia electronic textbooks. The main purpose of the use of computer technology in the educational process is to ensure that students and users in a short period of time acquire, consolidate, review and test knowledge in the classroom.

In the training of competitive personnel in engineering, technical and technological and similar fields in higher education institutions, it is impossible to imagine without the subject of descriptive geometry and engineering graphics. Because an engineer or an engineer-educator cannot be an expert in his field without studying this science. Nowadays, in the process of development of computer technology, the use of multimedia electronic textbooks prepared in modern computer technology to develop students' spatial imagination, creative thinking skills remains an urgent task today.

One of the big problems (drawing, re-drawing and explaining on the board) is the lack of time to convey to students the information on a given topic in the teaching of graphic geometry and engineering graphics taught in higher technical education institutions. Solving them requires the use of computer technology in the educational process. Especially in students there is a need to use computer technology, multimedia electronic textbooks to develop spatial imagination, creative and independent work skills, and as a result, their mastery is high.

A number of scientific studies on the use of computer technology in the educational process

have been conducted in our country and abroad.

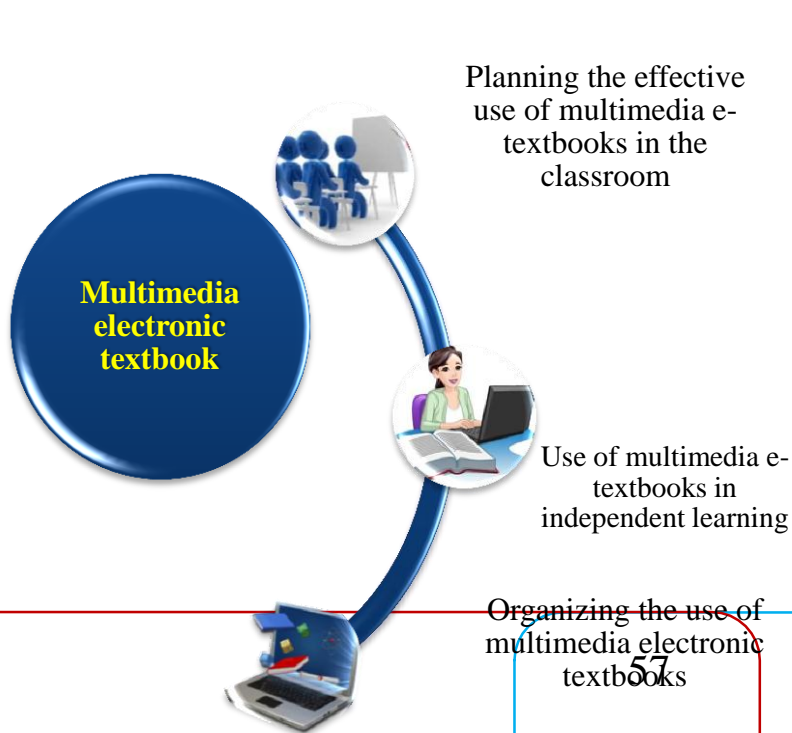
R.Khorunov, Yu.Kyrgyzbaev, I.Rakhmanov, R.Ismatillaev, Sh.Murodov, D.Kuchkarova, B.Khaitov and A.Umronkhodjaev, B.Khodjaev, E.Ruziev, Sh.Abdurahmanov, K. Although research has been conducted to improve the quality of Zoirov, A. Khamrakulov, J. Yodgorov and others, the problems of improving the quality and efficiency of the use of multimedia computer technology in teaching science have not been sufficiently studied.

Neda Bokan, Marko Ljucovic, Srdjan Vukmirovic, S.S.Gulamov, U.Yu.Yuldashev, U.Sh.Begimkulov, F.M.Zakirova, N.I. from scientists of the republic and foreign countries on the use of computer technologies in education. Taylaqov, S.S.Beknazarova, A.K.Khamraqulov, S.V.Panyukova, O.V.Lvova, Z.N.Matyakubova, D.S.Saidaxmedova, G.S.Ergasheva, Ch.T.Shakirova V.V.Dovgan, M.A.Surxaev, I.V.Robert, E.S.Polat, I.G.Ejlik, T.N.Suvorova, M.I.Belyaev, O.K.Tixomirov, V. V. Kondratova and others conducted research.

On the development of spatial imagination IP Istomina, OV Razumova, LV Zanfirova, LP Rusnova, AV Piliper Yu.A. Olkova, EP Benenson, NS Podkhodova, A.I.Xubiev, L.N.Anisimovoy, X.A.Arustamovym, A.D. Botvinnikov, E.F.Bykovoy, G.A.Vladimirsk, N.A.Dobrovolskoy, A.V.Ivanov, I.Ya.Kaplunovich, Yu.F.Katkhanov, E.I.Korzinov, I.I.Kotov, M.N.Makarov, A.A.Pavlov, V.S.Stoletnev, V.I.Yakunin, Yu.A.Volkova, P.A.Ostrozhkov and others conducted scientific researches.

Today, there are problems in imparting knowledge to students in the field of graphic geometry and engineering graphics due to the reduction of teaching hours. The existing problem can be solved through the effective use of modern computer technology in finding the optimal solution. Students should have a spatial imagination in order to understand and consolidate the knowledge acquired in the study of the science of descriptive geometry and engineering graphics. It is advisable to use multimedia computer technology to develop spatial imagination in students in a short period of time.

Practical work on the development of students' spatial imagination on the basis of multimedia computer technology in the teaching of descriptive geometry and engineering graphics. For this purpose, a multimedia electronic textbook on descriptive geometry and engineering graphics (multimedia e-book, a set of level tasks, intellectual computer games, video lessons, multilevel level tests, virtual detail models, glossary) was created.



In order to solve the problems of developing students' spatial imagination and creative thinking skills in teaching the subject of descriptive geometry and engineering graphics using a multimedia electronic textbook, the following were identified:

When using multimedia electronic textbooks to develop students'

spatial imagination in teaching the subject of descriptive geometry and engineering graphics, attention should be paid to the following.

The use of a multimedia e-textbook in the classroom is directly related to the type of lesson (Lecture and Practice), and when using a multimedia e-textbook, the teacher can take advantage of modern pedagogical technologies in combination with traditional methods.

Multimedia electronic textbook



To the spatial imagination of students



To students' creative thinking skills



effective use of sections of multimedia e-textbook in the educational process



to ensure the harmonization of teaching methods based on multimedia computer technologies with traditional teaching methods.



to ensure that students do not become bored and tired

Depending on the type of lesson, the science teacher determines the time of use of modern pedagogical technologies and multimedia electronic textbooks. The use of multimedia e-textbooks does not require excessive knowledge of the teacher. Therefore, the teacher was able to allocate class time correctly.

On this basis, he can organize the lesson by referring to the multimedia e-textbook when needed. The lecture effectively contributes to the quality of the lesson and the mastery of the students as a result of allocating the time of the lessons according to the plan.

Demonstrating their spatial solutions before solving problems provides students with spatial imagination, independent thinking, and a creative approach to the problem. It also provides an opportunity for students to point back to the part they don't understand on the topic until they understand it. Also, if there are interactive models of this type of problem, students will complete their assignments in interactive models. By entering the parameters of the tasks in the interactive model, the task solution appears on the screen [7]. In AutoCAD, it is also possible to shape students' spatial imagination through standard details. These

details can be made in different ways through the necessary dimensions in the creation. This opportunity can be compared to a virtual experience stand. You can also perform the necessary editing operations on its parameters and details.

A brief algorithm for using the multimedia electronic textbook in the course of lectures is as follows:

Use a multimedia e-book to review the previous topic, ask and answer questions, and publish a new topic (10 minutes);

The teacher briefly outlines the main points of the topic (definition, rules, concepts) with the help of a multimedia e-book, the relevant drawings are presented in animated, spatial and epic,

as well as in video (25 minutes);

Displays virtual detail models of thematic drawings. (5 minutes);

Another drawing on the topic is shown on the board (25 minutes);

Uses an intelligent computer game (10 minutes).

Questions and answers will be asked for reinforcement (5 minutes).

A brief algorithm for using the multimedia electronic textbook in the process of practical training is as follows:

The teacher gives a brief overview of the topic and is given an animated drawing of the relevant drawings on the assignment using a multimedia e-book (20 minutes);

Virtual detail models of the topic assignment are shown and edited. (5 minutes);

Drawings on the topic are displayed on the board (10 minutes);

Complete practical assignments on paper using a multimedia e-book (35 minutes).

With the help of video lessons students develop spatial imagination and creative thinking skills (5 minutes)

Practical assignments for independent study (as homework) (5 minutes).

As a result of the use of multimedia e-textbooks in the process of independent study, students will have: brief and accurate information on the required information on the basis of the content of lectures and practical classes. Can see and learn themed drawings in animated and video form. In addition, the drawings will be able to automatically and automatically control the drawing sequence. Practical assignments can be viewed through the option and a sample of their execution. The student can review the sequence of completion of the task and the part he / she did not understand in order to consolidate and master it. It acts as a tutor to the students.

A multimedia e-textbook can also be used in lectures, practical classes and independent study. The e-textbook provides a full range of science demonstrations. It is also the basis for enriching, testing, shaping and developing knowledge based on it.

TABLE 1

№	Course parts	Time min	80	Teacher activity	Student activities
1.	Organizational part	10		Repetition of the previous topic through questions and answers, as well as the use of a multimedia e-book for further strengthening and the publication of a new topic	The answer to the question can be chosen by the teacher or by raising the hand of the willing student himself
2.	The teacher briefly describes the main points of the topic (definition, rule, concept)	25		Using the multimedia e-book, the relevant drawings will be presented in animated space and on the screen, as well as in video.	Students write notebooks of information and draw sample sketches
3.	Show thematic drawings	5		Virtual detail models are displayed	Students observe, analyze, and thus increase their

				spatial perception of the details shown
4.	Draw another sketch on the topic	25	The display is displayed on the board	Draws the sample practical assignment shown in the drawing in the notebook
5.	Consolidation of knowledge on the subject through computer technology	10	Uses an intelligent computer game.	Looks for game-related information on a relevant topic from a notebook or book and tells the teacher the word needed
6.	The final part	5	Questions and answers will be asked to reinforce.	Strengthens the acquired knowledge and actively participates

In order to determine the accuracy of the research, experimental work was carried out on the teaching of descriptive geometry and engineering graphics using multimedia computer technology. Experimental trials were conducted throughout the semester (Table 2). At the Namangan Institute of Civil Engineering, groups were selected for the study: 1st control group (43-44-YM-20), 2nd experimental group (45-46-47-YM-20) in the autumn semester of the 2020-2021 academic year. was carried out. Teaching was organized in a hybrid form, i.e. lecture classes were distance, practical classes were in the traditional form. The experiment was conducted in weeks. The following topics were covered during the weeks:

Topics covered in weeks 1-2: point, straight line, plane;

Topics covered in Weeks 3-4: Methods of reconstructing the epyur, curves;

Topics covered in weeks 5-6: surfaces intersecting with their plane;

Topics covered in weeks 7-8: Intersection of surfaces and axonometric projections.

Over the course of the week, there was an increase in mastery and quality indicators.

TABLE 2

Observations	Groups	Number of students	5 reviews	4 reviews	3 reviews	unsatisfactory
1-2 weeks	Control group	50	5	12	26	7
	Experimental group	75	15	25	30	5
3-4 weeks	Control group	50	5	12	27	6
	Experimental group	75	15	25	33	2
5-6 weeks	Control group	50	6	13	26	5
	Experimental group	75	16	25	32	2
7-9 weeks	Control group	50	6	13	27	4
	Experimental group	75	18	25	31	1

In conclusion, based on today's requirements, the improvement of students' mastery as a result of teaching the subject of descriptive geometry and engineering graphics using multimedia computer technology has been proven in experiments. Only when a student develops a spatial imagination can he master the science of descriptive geometry and engineering graphics. Therefore, the teaching of the science of descriptive geometry and engineering graphics requires, first of all, the development of the student's spatial imagination. As mentioned above, the use of modern computer technology as the most invincible tool is in demand today.

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