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MONITORING AND CRITERIA FOR THE EFFECTIVENESS OF TEACHING GRAPHIC DISCIPLINES TO JUNIOR COURSES STUDENTS OF CREATIVE AND TECHNICAL SPECIALTIES

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Abstract. In modern conditions of development of the higher education system, requirements are put forward for graduates related not only to knowledge, skills and abilities in the professional field. Personal qualities such as independence, initiative, originality of thinking, communication skills, the ability to generate ideas, readiness to solve problem situations that do not have pre-developed algorithms and means of solution, are not less important. They all have great importance in the further educational and professional activities of an architect, designer, engineer. In the overall task of improving the educational process, perhaps the most important problem is the quality of teaching, which largely depends on the teaching methodology.

Drawing is the international language of architectural and artistic specialists and engineers of various specialties. The disciplines of the graphic cycle, which include descriptive geometry and engineering graphics, are studied by students of architectural, artistic and technical fields in universities in their junior years. The result of the training is the development of spatial representation, the acquisition by students of high-quality graphic skills, the ability to graphically solve applied problems, correctly create and “read” drawings, and also know the basic requirements and rules for the preparation of design documentation. The main goal of our research is to monitor and test the criteria for the effectiveness of teaching graphic disciplines during the academic year, as well as to summarize the results on the development and improvement of approaches to the methodology of teaching graphic disciplines and their impact on the quality of education of first- and second-year students in architectural, artistic and technical specialties.

The work uses theoretical and empirical methods: analysis, classification and generalization of the research source base; author's experience in organizing the educational process; diagnostics of students' classroom graphic work with timing of time spent, as well as their homework. Our many years of experience show that junior students can gain in-depth knowledge only if they are highly motivated, systematic individual work and obtain detailed knowledge on their own. The presented results of a study of monitoring the educational process of teaching graphic disciplines and the influence on the quality of teaching of various methodological and many other important factors, from our point of view, can be assessed as quite significant, so it is necessary to continue searching in this direction in the future.

Keywords: graphic disciplines, monitoring, junior students, performance criteria, methodological tools.

Statement of the problem in a formal way. Relevance of the research. The importance of graphic disciplines for the professional training of an architect, artist, designer and engineer is fundamentally important; they expand the capabilities of future graduates, making them universal specialists. Graphic competencies are quite significant for applicants in such areas, so high-quality graphic training is an urgent problem. In the process of studying these disciplines, students are given a focus on developing both graphic skills, artistic skills, a sense of harmony and style, and on the development of creative associative and artistic thinking. Our study is related to the research work "Improving the organization of the educational process using distance learning methods and methods of teaching graphic disciplines to students of construction and architectural and artistic specialties based on a competency-based approach", which has been carried out at the Department

of Descriptive Geometry and Engineering Graphics of the Odesa State Academy of Civil Engineering and Architecture (OSACEA) for many years.

Analysis of recent research and publications. The state of graphic training in higher education institutions is widely discussed in the research of modern scientists and geometers [1, 63-75; 2; 103-113; 6, 27-28; 7, 188-193; 12, 36-47; 14; 18, 326-331, etc]. Of particular interest are the works that address the issue of effective application of methodological developments in terms of the content and scope of educational tasks [4; 5; 8, 131-134; 10, 152-160, etc.] Studying the experience of teaching graphic disciplines by different teachers, we emphasize that each of them has his or her own view on the methodology and methodology of using certain didactic tools and forms of control, so, from our point of view, to improve the efficiency of the educational process and achieve its best results, the joint work of different teachers is necessary. The problems of topics and scope of assignments remain unresolved - separately by specialties [3, 202-205; 9, 167-173; 13; 17, etc.].

Purpose and objectives of the study. The main purpose of our study is to summarize the results of the development and improvement of approaches to the methodology of teaching graphic disciplines in both Ukrainian and English. Using theoretical and empirical methods, we demonstrate the monitoring and provide criteria for the effectiveness of teaching graphic disciplines to first- and second-year students of architectural, artistic and technical specialties.

Main material. Descriptive geometry is the theoretical basis for constructing drawings that are complete graphical models of spatial objects. Its main tasks are to study theoretical methods of graphical construction of three-dimensional objects on a plane, to acquire practical skills in making images (orthogonal, axonometric, perspective, etc.) and graphical methods of solving applied problems. This discipline is one of the first graphic disciplines that begins the professional education of future architects, artists, designers, or engineers. Mastery of graphic language, which is the most important factor aimed at conveying basic visual information, should be built on the principle of a systematic approach and used as a tool aimed at developing spatial and creative imagination [11, 44-48; 15, 127-143; 16, 173-180; 19, 201-206, etc.]. For several years now, OSACEA has been teaching graphic disciplines in English, which is one of the important motivational factors for students. As a rule, classroom classes are conducted in a bilingual form, that is, the provision of educational material is mixed - in Ukrainian and English. To carry out the educational process and conduct classes in graphic disciplines, the department has created an educational and methodological complex, which includes lecture notes (in Ukrainian and English), a study guide, a workshop, methodological recommendations on the topics of graphic tasks, etc.

By monitoring, we mean a set of procedures for observing and currently evaluating the process of teaching graphic disciplines with a comparison of the quality of students' graphic tasks. In addition, the orientation of the obtained results to achieving success in general and increasing the motivation of students in education investigated. A comparative approach used in the project monitoring process. Experimental researches to study internal monitoring of teaching graphic disciplines and its impact on the quality of student performance were carried out at the Department of Descriptive Geometry and Engineering Graphics of OSACEA in the period 2021-2023. among 90 junior students of architectural, art and construction specialties. . The introduction of monitoring was preceded by significant work to establish and generalize theoretical indicators and basic comprehensive criteria for the effectiveness of assessing the quality of academic performance. The criteria-based methodology for internal monitoring of the quality of graphic work during the semester, developed by the author, was also tested, which was based on the author’s long-term research results.

Evaluation effectiveness criteria were grouped according to the following indicators: students' presence at lectures, and separately, practical classes, as well as at consultations, activity at relevant events, timely completion of tasks by the assigned deadline, verification of students' independent processing of methodical support of the discipline, etc. (**Table 1**).

Table 1

Characteristics of quantitative factors of the research base

	Group 1	Group 2	Group 3	Group 4	Notes
Number of students in the group	30	20	22	18	
Attendance at lectures	70%	70%*	80%	100%	*online
Attendance for practical classes	90%	60%*	90%	100%	* online
Consultation attendance (in the audience)	90%	40%*	70%	95%	* online
Coefficient 1: timely completion of tasks within the set deadline	0.8	0.4	0.6	0.9	*max* 1.0
Coefficient 2: verification of students' independent development of methodical support of the discipline	0.2	0.1	0.2	0.8	*max* 1.0

Notes. 1. Distribution of groups: **group 1** - students of the 1st year majoring in "Fine Art", discipline "Geometry of Images" (30 students in total); **group 2** - students of the 2nd year in the specialty "Graphic Design", the discipline "Descriptive Geometry" (20 students in total); **group 3** - students of the 1st year majoring in "Construction and Civil Engineering, discipline "Engineering Graphics" (22 students in total); **group 4** - students of the 1st year majoring in "Construction and Civil Engineering, English" discipline "Engineering graphics" (18 students in total).

2. The number of students accepted selectively.

Summarizing the results of **table 1**, we emphasize that the presence of students at lectures and practical classroom and online classes, as well as at consultations, had a certain influence on the quality of execution and timeliness of providing graphic works. This will later be confirmed in our work.

The results were obtained by methods of expert evaluation classification and point evaluations. The scheme of the study provided for a comparison of the obtained measurement results and the manifestation of the symptoms of each of the criteria. To ensure their comparability, they were translated into a 100-point scale. At the same time, the distribution of points by level of quality was as follows: high level of the quality of the educational process - 90-100 points, sufficient level - 75-89 points, higher average - 63-74 points, medium level - 50-62 points, low - up to 49 points. Control measures are mandatory elements of feedback in the learning process. Each control event in any discipline must have a clearly thought out content and form of control and criteria for evaluating the results. The main tasks of the system of control measures for checking the quality of education are the formation of systematic, stable competences of students, as well as increasing the motivation of students for systematic active work throughout the entire period of study.

We will present the algorithm for calculating the criteria using the example of evaluating the MUTUAL INTERSECTION OF TWO POLYHEDRON SURFACE, topic **Positional Problems (fig.1).**

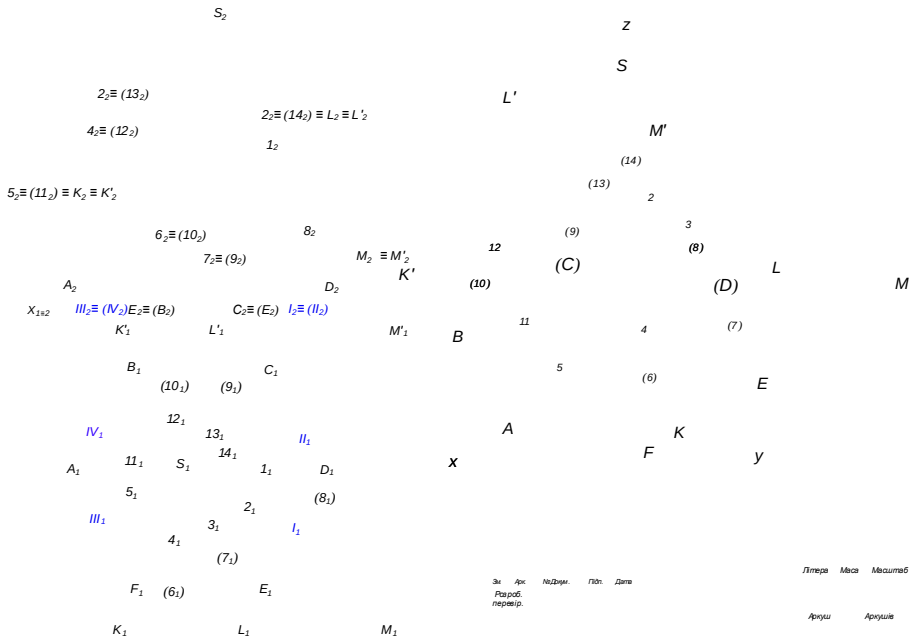

Fig.1. The construction of the line of intersection of two polyhedral surfaces in orthogonal projections (A3 format)

This is one of the important, but not simple, classical problems of Descriptive geometry - the construction of the line's projections of intersection of two polyhedral surfaces in orthogonal projections. All four groups of students who participated in the experiment performed this planned problems. The deadline is two weeks. According to the teacher's explanations and with the help of a visual image - a rectangular isometry, the students complete this problem for approximately 80% in the classroom and pass it for examination.

Then began the final stage of evaluation and comparison of the quality of graphic work by students of different groups using the author's criteria system (Fig. 2).

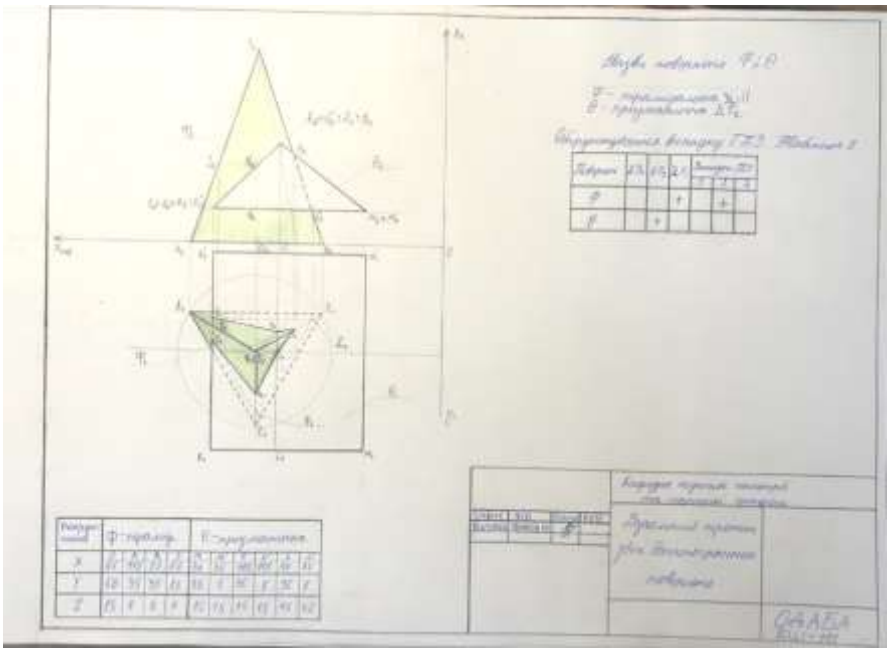

Fig. 2. Graphic work of the student (individual option): approximately 75% of the volume of execution

According to the above criteria for evaluative classification, journals compiled for each of the four groups based on points (grades based on ECTS principles on a 100-point scale) with mandatory recording of the deadline and quality of graphic work. Next, the results were compared and the indicators of each criterion were evaluated (Table 2).

Table 2

Comparative table of expert assessment of the quality of graphic tasks

	Group 1	Group 2	Group 3	Group 4	Примеч.
Problem No. 1 (A3 format)	80 points	70 points	70 points	85 points	*The average score for the group
Task No. 2 (two A3 formats)	70 points	65 points	65 points	85 points	
Problem No. 3 (A3 format)	80 points	65 points	75 points	95 points	
Problem No. 4 (A3 format)	85 points	75 points	70 points	95 points	
Problem No. 5 (A3 format)	90 points	80 points	85 points	95 points	

Listed in the **table 2** results lead to very interesting and ambiguous conclusions. It can be stated, first of all, that during the initial period of adaptation of students to the higher educational institution in general and, separately, to the study of graphic disciplines, the average score of graphic tasks according to the criterion system improves (from **Problem No**. **1** to **Problem No. 5**). Secondly, the students are very interested in the tasks on applied problems of Descriptive geometry - and this is **Problem No. 4** and **Problem No. 5**, therefore the average score on these graphic works improves significantly. Thirdly, from the generalization of monitoring studies from table 1 and table 2, it is clearly possible to trace the connection between the attendance of classes and consultations by students and their motivation to study, and hence there is a desire for independent work with methodological support. This corresponds to one of the main tasks of higher education - to prepare high-quality competitive specialists for both the domestic and international labor market.

Thus, a very dense study was conducted, painstaking work was done, taking into account multivariate analysis, considering that the teachers - lecturers and teachers who conducted practical classes and consultations - were different teachers. It should emphasized that in practical classes, the teacher does not need to repeat the lecture material, but only to disseminate and concretize the knowledge gained in the lectures. It is also important to note that safety should come first, so in these turbulent times, a differentiated approach to teaching in general is one of the most important. At the present stage, unfortunately, education is not always in line with the principles of accessibility and continuity, and some students are not ready for the challenges of modern society. Thus, in today's realities, it is of great importance to perform tasks with the help of various digital technologies, and achieving a high level of quality of graphic training also depends on the effectiveness of the methodological and methodological implementation of the discipline and on the professionalism and dedication of a particular teacher

Conclusions. Prospects for further research. Our many years of experience in teaching graphic disciplines allows us to say that individual graphics knowledge and skills of students of creative and technical specialties are one of the most important components of professional competence and presuppose the possession of the required amount of special subject skills, the ability to effectively apply them in solving educational and creative tasks. It can be determined that first-year students can gain deeper knowledge only under conditions of high motivation, systematic individual work and obtaining more detailed knowledge independently. We emphasize that the formation of professional graphic competences of future specialists is impossible without a thorough study of the basics of graphic literacy, therefore, improving the skills and elements of graphic culture of first-year students begins already in the first semester. Graphic competences are important for the future professional activity of the graduate, which gives freedom in the creative implementation of the entire design process from the conception of an idea to its implementation. The presented results of a study of monitoring the educational process of teaching graphic disciplines and the influence on the quality of teaching of various methodological and many other important factors, from our point of view, can be assessed as quite significant, so it is necessary to continue searching in this direction in the future.

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МОНІТОРИНГ І КРИТЕРІЇ ЕФЕКТИВНОСТІ ВИКЛАДАННЯ ГРАФІЧНИХ ДИСЦИПЛІН СТУДЕНТАМ МОЛОДШИХ КУРСІВ ТВОРЧИХ І ТЕХНІЧНИХ СПЕЦІАЛЬНОСТЕЙ

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Анотація. У сучасних умовах розвитку системи вищої освіти до випускників висуваються вимоги, пов'язані не тільки зі знаннями, вміннями та навичками у професійній сфері. Не менш важливе значення відіграють такі особистісні якості, як самостійність, ініціативність, оригінальність мислення, комунікабельність, здатність генерувати ідеї, готовність розв'язувати проблемні ситуації, які не мають заздалегідь розроблених алгоритмів і засобів розв'язання, що відіграють не менш важливу роль у професійній діяльності архітектора, дизайнера, інженера, ніж знання будь-якої дисципліни. У загальній задачі вдосконалення навчального процесу чи не найважливішою є проблема якості навчання, яка в значній мірі залежить від методології викладання.

Креслення є міжнародною мовою спеціалістів архітектурно-мистецького профілю та інженерів різних спеціальностей. Дисципліни графічного циклу, до яких належать нарисна геометрія та інженерна графіка, вивчаються студентами архітектурно-мистецьких та технічних напрямів у вишах на молодших курсах. Результатом навчання є розвиток просторового уявлення, набуття студентами якісних графічних навичок, умінь графічно

вирішувати прикладні завдання, правильно складати та "читати" креслення, а також знати основні вимоги та правила до оформлення проектно-конструкторської документації. Основною метою нашого дослідження є мониторінг та апробація критеріїв ефективності викладання графічних дисциплін протягом навчального року, а також узагальнення результатів щодо розвитку і вдосконалення підходів до методології викладання графічних дисциплін та їх вплив на якість навчання студентів першого і другого курсів архітектурних, художніх та технічних спеціальностей.

У роботі використані теоретичні та емпіричні методи: аналіз, класифікація та узагальнення джерельної бази дослідження; авторський досвід організації навчального процесу; діагностика студентських аудиторних графічних робіт із хронометражем тимчасових витрат, а також їх домашніх завдань. Наш багаторічний досвід показує, що студенти молодших курсів можуть отримати глибші знання лише за умови високої мотивації, систематичної індивідуальної роботи та отримання детальніших знань самостійно. Наведені результати дослідження моніторингу навчального процесу викладання графічних дисциплін та вплив на якість навчання різних методологічних та ще інших багатьох важливих факторів, з нашої точки зору, можна оцінити досить значущими, тому необхідно в перспективі продовжити пошуки в цьому напрямку.

Ключові слова: graphic disciplines, monitoring, junior students, performance criteria, methodological tools.