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PROJECT ACTIVITIES IN THE PROCESS OF TEACHING TECHNICAL DISCIPLINES

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Abstract. *The paper shows the interdisciplinary communications of graphic disciplines; states the successful formation of design and engineering competence of the future engineer requires not only connection between adjacent programs, but also engaging students in real projects that ensure the transfer of knowledge from different disciplines; interprets the research findings.*

Keywords: *interdisciplinary communications, educational projects, design and engineering competence, graphical training, graphical disciplines, engineer.*

Introduction.

In connection with the integration of Ukraine into the European educational and scientific space the need for engineers who are ready to carry out research and inventive work, taking into account technological progress, can independently solve professional problems and design ways of their implementation has intensified. Thus, Z. Bakum points that the application of the relevant principles, methods, forms and techniques will contribute to the formation of design and engineering competence for students and enhance of interdisciplinary communications will provide a comprehensive view of the practical results of the future professional activity [1].

Purposeful implementation of interdisciplinary communications between related disciplines will ensure consistency, coherence and continuity of the acquired knowledge; stimulate motivational activities that will effectively influence the effectiveness of the learning process. The student should understand the necessity for an integrated application of acquired knowledge, using the skills of independent cognitive activity, the ability to carry out interdisciplinary analysis, synthesis and integration of knowledge.

**Main text.**

In the context of the solving problem it is important to mention that modern didactics considers interdisciplinary communications as one of the most important conditions for improving the efficiency of the whole educational process. Scientists who study various aspects of the outlined problem (Z. Bakum, I. Holiiad, A. Dedzhula, Yu. Belova) emphasize that interdisciplinary communications provide not only the acquisition of relevant knowledge, but also expand scientific and professional horizons, develop logical and abstract thinking, cognitive abilities, students' activity and interest to learning. Interdisciplinary communications are the foundation for the perception and understanding of new knowledge, formation of skills that allow organizing and summarizing of the existing experience and ensure the completeness of the information of professional nature.

One of the most important stages in the formation of a competent professional is graphical training which is aimed at the development of spatial thinking, project vision, designing skills, personal and professional qualities [2]. That is why every topic and section of the graphic disciplines cycle should contain specific interdisciplinary material for deepening and understanding of basic concepts, develop the ability to use information not only from studied, but also from other related disciplines. Accordingly, strengthening interdisciplinary graphic communications will facilitate the acquisition of solid knowledge needed for training and later professional activity.

Formation of design and engineering competence in teaching graphic disciplines requires implementation of interdisciplinary communication between close in content subjects (mathematics and descriptive geometry, engineering graphics and engineering mechanics, computer graphics and computer science, etc.). Thus, when solving problems in descriptive geometry students should be able to apply knowledge of plane geometry and solid geometry which were mastered during the school learning.

Solving graphics tasks students perform the integration of acquired knowledge with interest (share a segment in graphic way into two or more parts, hold perpendicular from point to line, bisect angle, carry out a circle through two points, tangential circle through point, determine the length of the arc with minimal error (Huygens formula)



which promotes efficient absorption of new knowledge in teaching graphic disciplines.

Later, performing graphics tasks in software environment «AutoCAD» from the course «Automated design systems» students form design and engineering skills get practical experience for future professional activities applying the knowledge gained at workshops in engineering graphics. Students in the course of this work should be able to justify their decisions depending on the particular purpose, based on information provided by graphic discipline; using information not only from studied, but also from other related disciplines; drawing information from different disciplines with extensive use of interdisciplinary communications.

To perform this it is enough to simply focus on graphic images: in the course of mathematics – graphs and diagrams; in the study of computer graphics – elements of computer science and engineering graphics; in the course of theoretical mechanics and strength of materials – calculation models; while studying geodesy and cartography – topographic image of the surface and so on. Such organization of educational process requires not only communication between adjacent programs but engaging students in real projects that ensure effective transfer of knowledge from different disciplines.

Implementation of interdisciplinary graphic communications through educational projects will attract future engineers to real practice, development of personal creativity, ability to work in a team using communication skills and independent experience, willingness to answer not only for performed work but also for the entire project that will provide student's readiness for responsible use of graphics knowledge obtained in their practical application field. Educational projects help to solve the problems of preparing young people capable of creative work, independent learning and communication, which involves the development of design, engineering and organizational skills.

Students must learn to use the complex knowledge for implementation of practical research activities. Therefore, the implementation of educational projects in the process of graphical training means involving students into identifying and analyzing real practical problems related to future professional activity with the use of interdisciplinary graphic communications (Figure 1).

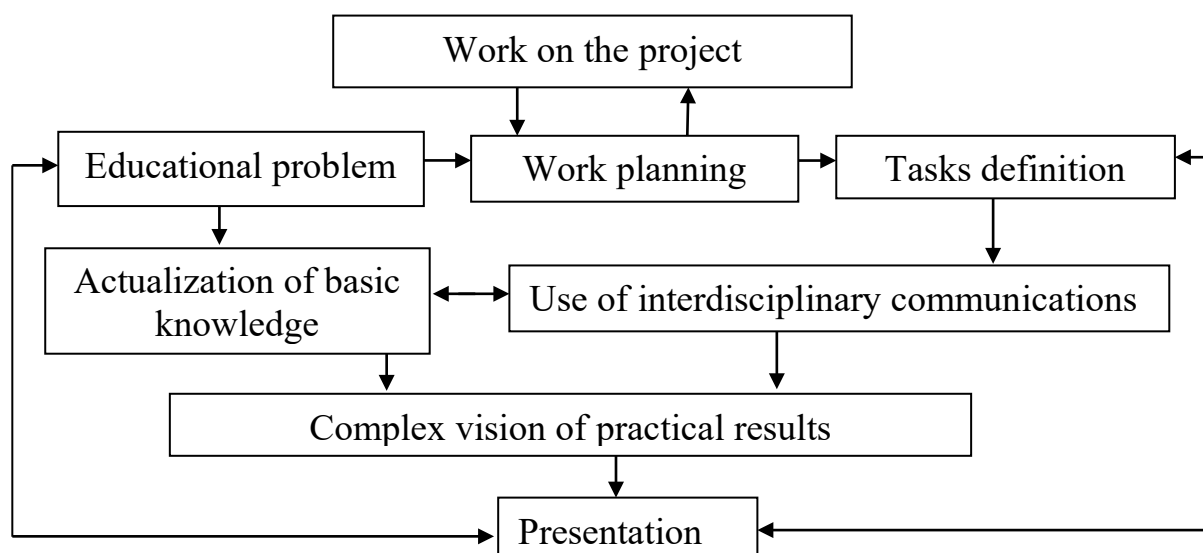


Figure 1 – Stages of working on educational project in the process of graphical training

Authoring

To identify skills to carry out interdisciplinary analysis, synthesis and integration of knowledge engineering students were proposed to join the educational project on «Forming the basics of design and engineering competence in carrying out the assembly drawings» with the help of the graphical program «AutoCAD». The results are given in (Table 1).

The results show that involving students into educational projects enhances interdisciplinary graphic communications which contributes to the formation of design and engineering competence of the future engineers in teaching graphic disciplines. Fig. 2 shows lined with horizontal line average amount of scores in total (76.07). Selective medium according to the formation levels of the mentioned competence are close to the average values of these levels (2 – low, 3 – sufficient level 4 – normal 5 – high level of formation of design and engineering competence).

Analysis of selective medium and standard deviations of the formation levels of the design and engineering competence allows to assert that future engineers are aware of the need to engage knowledge from different disciplines not separately but comprehensively. This is indicated by the dynamics of average scores growth on each level (Figure 2) and reduce of standard deviation (Figure 3).



Table 1 – Comparative distribution of the formation levels of design and engineering competence in the implementation process of educational projects

Formation level of design and engineering competence	Selection scope	Relative amount of students, %	Selective medium	Standard deviation
Low	27	8,4	64,07	2,85
Sufficient	95	29,8	73,50	2,20
Normal	187	58,6	82,72	2,17
High	10	3,2	92,00	1,25
Total	319	100,0	76,07	6,53

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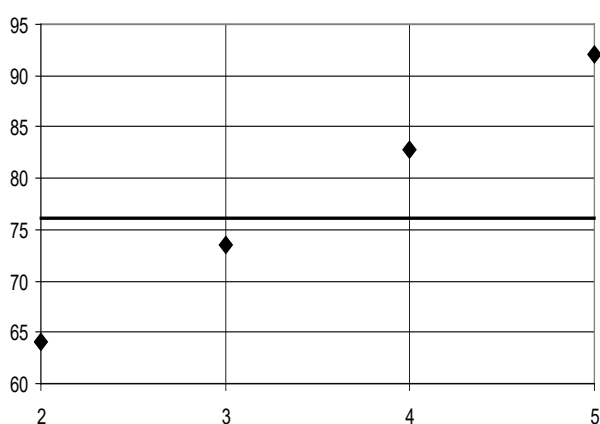


Figure 2 – Selective average

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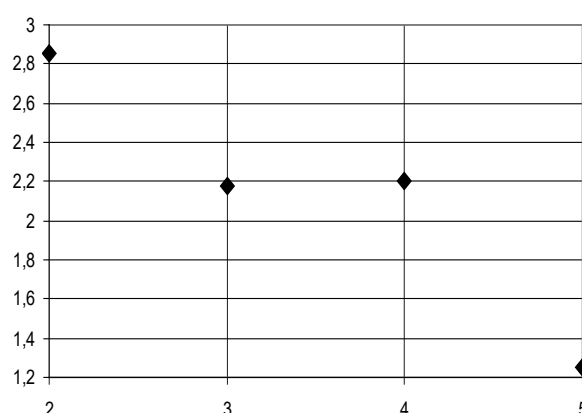


Figure 3 – Standard deviation

Summary and conclusions.

On the basis of the above mention we can say that educational projects draw students nearer to their future activity, contribute to the implementation of interdisciplinary graphic communications, acquisition of knowledge related to real practice. Thus, 30% of students in the performance of the training project are able to involve information from different disciplines with extensive use of interdisciplinary communications; 25% can apply interdisciplinary communications and information and communication technologies in the artistic, creative activity; 25% are ready to consciously use obtained graphical knowledge in their practical application field; 20% are able to carry out interdisciplinary analysis, synthesis and integration of knowledge.

Consequently, the capabilities of educational projects have great potential in forming creative personality, able to update his or her skills and find ways to manifest



individual activity. Such organization of educational process will allow to carry out interdisciplinary analysis, synthesis and integration of knowledge that will contribute to a comprehensive vision of the practical results of future professional activity through the implementation of educational projects.

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