



## ISSUES OF IMPLEMENTING THE INTEGRATION OF “ENGINEERING COMPUTER GRAPHICS” WITH SPECIALTY SUBJECTS

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### ABSTRACT

The process of formation of knowledge and skills through interdisciplinary integration allows to identify the leading ideas and main concepts of the studied material, to deepen and enrich their content within one discipline, as well as the interaction of the surrounding processes and events with each other. shows its organic connection, reveals its material integrity and strengthens the scientific level of teaching. In addition, it develops students' independent thinking, transfer and generalization skills from one discipline to another.

**KEYWORDS:** Knowledge in students, summarized in terms of methodological categories, and reveals epistemological problems.

### INTRODUCTION

Interdisciplinary integration appears as an epistemological form of systematicity in education and is unique in the study of one or another object. The multi-faceted interaction of sciences forms specific knowledge in students, summarized in terms of methodological categories, and reveals epistemological problems. Therefore, the methodological function of interdisciplinary integration in the educational process is to ensure the unity of various processes and phenomena studied in different disciplines.

Interdisciplinary integration provides students with the opportunity to use their knowledge effectively in the study of various academic subjects and in the organization of industrial education, helps them to form a holistic view of events and processes.

It cannot be achieved without the use of interdisciplinary integration, which is one of the important criteria for the selection and coordination of the content of educational materials in the curricula of related subjects provided for in the curricula.

### LITERATURE REVIEW

In our republic, scientists such as A. Kholmurzaev, O. Alijonov, S. Saydaliev, N. Shokirova, N. Yodgorov, Sh. Murodov, T. Riksiboev conducted scientific research on the methodology of developing practical creative skills of engineers by means of engineering and computer graphics. . Pedagogical-psychological issues of development of engineering design competences of students of technical higher educational institutions, practical creative skills with the help of computer graphics, the role of computer graphics, peculiarities of information communication in the educational process D. Achilova, U. Nasritdinova, I. Rasulov, A. Khakhorov and others studied in scientific research.

From the scientists of the Commonwealth of Independent States (CIS) D. Mukhataev, N. Kaygorodtsev, D. Dashev, T. Tkachev, T. Chernyakov, O.Griban, O.Filatov, etc. have researched the issues of development of engineering design competences by means of computer graphics and improvement of the methodology of teaching "Engineering graphics and computer design" in technical higher education institutions.

L.T.Erig, A.P. Research problems of developing practical creative skills of engineers using computer graphics based on different approaches. Gambetta, B. Jones, R. S. Ferguson, A. Jalleralli, J. Rerenia, G. Frederick, A. Mitchell, E. Ronald, D. Juricic, T. Krueger, F. .Elucidated by foreign scholars such as Amari.

**METHODS**

Since the issue of interdisciplinary integration is one of the general aspects of improving the educational methodology, during our research we identified the following as the main difficulties in the implementation of the integration of "Engineering computer graphics" and "Specialization" subjects: the use of uncoordinated concepts and expressions; lack of separation of main ideas, theories and concepts from the educational material; the internal relevance of scientific knowledge, that is, the fact that knowledge is not logically complete, is not taken into account; Dispersion of academic subjects, their content is not connected and they are not studied consistently.

Interdisciplinary integration is characterized primarily by its structure, because the internal structure of the subject determines its form, accordingly, we distinguish the following forms of integration (Table 1):

In the first form, we divide the types of interdisciplinary integrations according to their composition. Interdisciplinary integration shows what can be learned from other academic subjects in the study of a specific topic. Based on this, since the composition of interdisciplinary integration is determined by the content of the educational subject, which is formed by skills, competences and thinking operations, the following types of interdisciplinary integration can be distinguished in their first form:

**Table 1:  
Classification of interdisciplinary integration by form and types:**

Forms of interdisciplinary integration	Types of interdisciplinary integration	The content of educational materials that make up the types of interdisciplinary integration
<b>By composition</b>	1. According to the content	Evidence, concepts, laws, theories
	2. According to the operations to be performed	On the skills, competences and thinking operations to be formed
	3. Methodological application	On the use of pedagogical methods
	4. By organization	Forms and methods of organization of educational processes
<b>According to the directions of integration</b>	Unilateral;	That's right;



<b>On the interaction of the elements that make up the integration</b>	According to the time factor	Chronological	Consistency; Synchronous; In the future.
		Chronometric	Local; Average over time; For a long time.

By content - by the unit of interpretation of concepts, events, processes studied in various academic subjects according to the content of the studied subject;

1. By the operations to be performed - by the skills, competencies and thinking operations that are formed in an interdisciplinary nature;
2. Methodological application - harmonizing the methods of educational work in different academic subjects, applying the same methods (graphical, analytical) in studying the topics of different academic subjects;
3. According to the organization - matching the forms and structure of the trainings in the educational subjects, among which integration is established.

## CONCLUSION

It is desirable to have an electronic textbook that includes all types of educational activities, lectures, practical exercises, methodical instructions, departmental tests. Such a textbook on "Engineering and computer graphics" completely frees students from searching for information, increases their interest in science. The electronic textbook is a great help in the work of the teacher, it creates more opportunities for teaching the subject. And the most important condition for its effectiveness is the presence of operational feedback that allows you to evaluate the successful development of a particular topic. For this purpose, control activities are carried out: written survey, test control, fulfillment of individual assignments. The obtained results allow students and teachers to change their actions.

A distinctive feature of studying graphic arts is the individualization of education, the teacher's careful control of each student's work. The teacher does not need to describe the solution to any problem on the board, because the entire sequence of the solution can be placed on separate slides. For example, in "Mechanical drawing" there are working drawings of details, sketches, structural drawings, etc. In "Engineering and computer graphics", it is recommended to use Kompas 3D V20.0.1 software to create technical drawings of complex parts, assembly drawings, part drawings, part sketches, diagrams, etc. Thus, the modern educational process is aimed at developing students' design competencies and not only graphic literacy, but also new information technologies, and it has been theoretically proven that the science of "Engineering and computer graphics" plays a major role in these processes.

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