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DIDACTIC SYSTEM FOR FORMING THE PROFESSIONAL COMPETENCE OF FUTURE ENGINEERS BASED ON AN INTEGRATIVE APPROACH

Abstract: The article presents methods for the targeted and effective use of digital educational resources in the world's leading higher education institutions and research centers, as well as large-scale research on introducing modern educational technologies into the educational process that contribute to the formation of technical thinking, spatial imagination, and creative thinking in students.

Keywords: digital educational resources, higher education, pedagogical activity, professional development, technical thinking, creative thinking.

Аннотация: В статье представлены методы целевого и эффективного использования цифровых образовательных ресурсов в ведущих высших учебных заведениях и научно-исследовательских центрах мира, а также широкомасштабные исследования по внедрению в учебный процесс современных образовательных технологий, способствующих формированию у учащихся технического мышления, пространственного воображения и креативного мышления.

Ключевые слова: цифровые образовательные ресурсы, высшее образование, педагогическая деятельность, профессиональное развитие, техническое мышление, творческое мышление.

Introduction.

Consistent work is being carried out in the republic's education system to improve the quality of education and the effective organization of the educational process in higher education institutions, which are an important link in continuous education [4]. In particular, providing students with meaningful and practical knowledge in a short period of time, forming skills and competencies

related to specific activities, and developing their creative and intellectual potential is manifested as one of the priority tasks of the educational process [3]. In today's information society, the introduction of innovative approaches to the field of education and the use of modern educational technologies are becoming an objective necessity. In particular, in the information educational environment, it is becoming

increasingly important to improve the professional competence of higher education students based on modern graphic programs and to improve pedagogical mechanisms aimed at developing their intellectual potential [1].

Literature review.

Analysis of the research problem shows that scientific research on the problems of improving professional competence has been conducted by domestic pedagogical scholars such as Sh.S. Sharipov, N.A. Muslimov, R.K. Choriev, U.K. Tolipov, Z.K. Ismailova, O.A. Kuysinov, D.A. Mustafoeva, M.M. Kodirov, A. Jumanov, and others. According to N.A. Muslimov, professional competence means mastering advanced technologies that enrich professional-pedagogical knowledge, skills, and abilities, and being able to use modern tools, techniques, and technologies. In the research of K.A. Grebennikov, the pedagogical and professional aspects of using computer graphics in the process of teaching general professional disciplines in the specialty "Hydroenergy" in higher educational institutions were analyzed. In the

research work conducted by E.M. Tretyakova, the technology for designing and implementing the content of the subject "Engineering Computer Graphics" for the specialty of hydropower in higher education institutions was developed [5].

Research methodology.

Based on the analysis of the opinions of the aforementioned scholars, we have provided our own author's definition of the concept of students' professional competence.

Professional competence of students - acquiring specific skills in using various technical devices and computer technologies, obtaining information from various sources, using it effectively in a generalized form, and developing skills in analytical data reconstruction "Includes knowledge of the characteristics of information flows in the field of science and professional activity. "The structural structure of graphic competence developed during the teaching of general professional and specialized disciplines ("Engineering Computer Graphics") developed by us.

PROFESSIONAL COMPETENCE			
Scientific-research. Organizing academic and scientific-research work; observing creative abilities; conducting professional-pedagogical activity using innovation	Academic-professional. Modeling, designing, and organizing educational activities; developing, determining, and predicting the professional qualities of a hydroelectric engineer	Educational-design. Developing the goals and objectives of education, the content of academic material, forms, methods, and designs of didactic and software tools for monitoring the results of professional-pedagogical activity.	Organizational-graph. Preparing a hydroelectric engineer, organizing the production process, creating academic and graphic environments

Figure 1. Structure of professional competence.

Applied graphics is considered one of the primary tools of design and construction activities. It is directly linked to the educational design process and the content of graphic education, allowing students to apply the knowledge gained from general cultural, psychological-pedagogical, general professional, and specialized subjects within a single system.

Analysis and discussion of results.

In the process of teaching general professional disciplines, great attention was paid to the introduction of interactive electronic educational resources in the creation of educational and methodological support that allows students to develop their professional competencies. We consider it

appropriate to use the "SCORE" methodology in the process of developing the professional competence of hydraulic engineers.

The "SCORE" method is one of the effective methods aimed at searching, sorting, analyzing information, and finding solutions to problematic situations.

Within the framework of the study, the possibilities of applying the "SCORE" methodology were considered on the topic "Processes of mutual intersection of planes and topographic surfaces in numerical projections, i.e., an apparel area" [1]. The role of this methodology in increasing educational effectiveness and the procedure for its application in the practical training process are reflected in Figure 2.

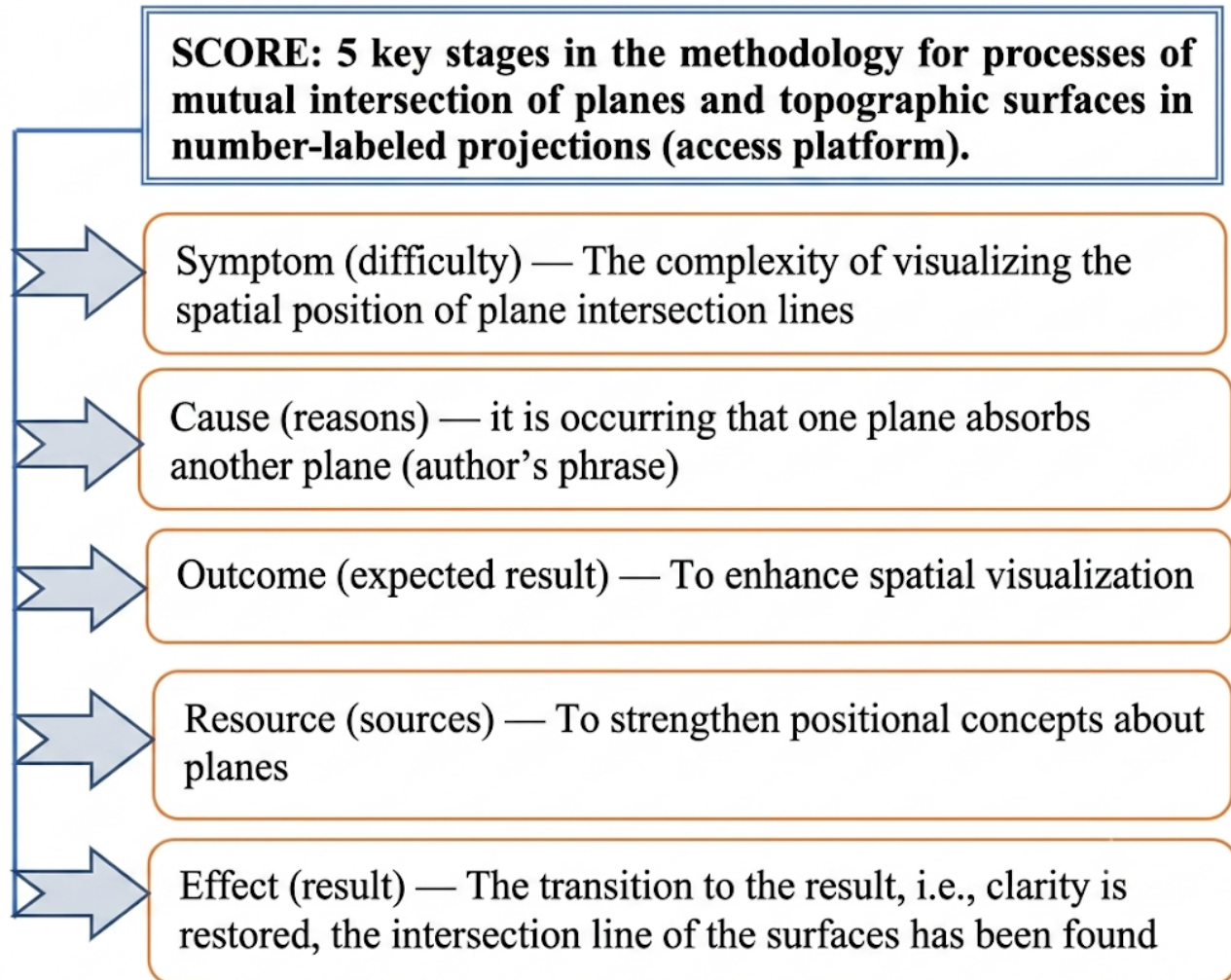


Figure 2. Application of the "SCORE" method

Symptoms, i.e., the main problem: Visualizing the intersection lines of planes in space creates certain difficulties for students. As a result, they have difficulty fully understanding which line is given or not given, as well as the position of the intersection line in space.

Reasons:

The main reasons for this problem are explained by insufficient formation of positional concepts regarding surfaces and their relative positions, as well as a lack of skills acquired through practical training.

Result:

To eliminate the identified shortcomings, it is first necessary to focus on providing consistent and understandable coverage of the topic during the educational process. Especially in problems related to determining the intersection lines of planes with each other or with a topographic surface, the teacher's speech, behavior, deep mastery of the topic, and ability to explain each point of the intersection line separately are of great importance [1]. In this process, the teacher's professional skills, the

ability to present the topic in a clear and logical sequence, the ability to explain the structure of the practical session to students in advance, and strict adherence to the established stages are considered essential components.

Sources:

In this methodological process, a sufficient level of knowledge, skills, and abilities, the availability of practical training necessary to achieve the set goal, and the ability to foresee the final result serve as important resources.

Effects, i.e., efficiency: The teacher should solve the problem not directly through a ready-made solution, but by creating conditions for students

to think independently and find a solution. Encouraging students to research, motivating them, and guiding them to independently find a way out of a problematic situation allows for the achievement of the expected educational result.

When using the SCORE model in the technical field, the professional experience and methodological skills of the teacher are of particular importance in the process of problem analysis, determination of expected results, and their achievement [6]. The structural composition of this process is shown in Fig. 2.a, b.

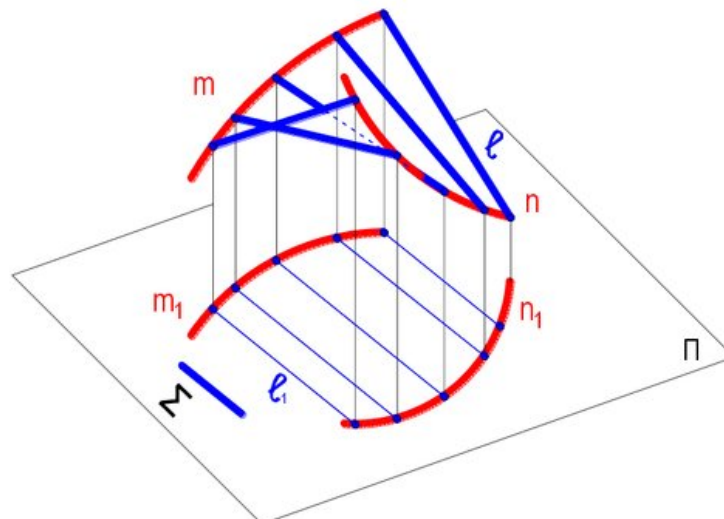


Fig. 2.a. Problem occurrence

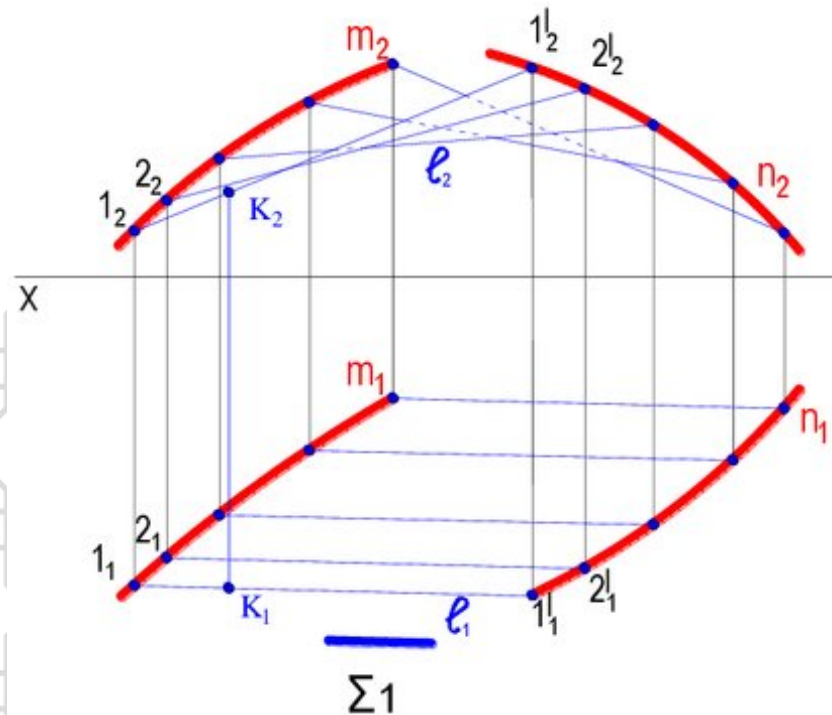


Figure 2.b. The solution to the problem

Conclusions and suggestions.

Analysis of empirical research results allows for the consideration of the following proven cases:

1. The level of general technical thinking among technical students is above average.

2. The traditional educational process in higher educational institutions specializing in technical education contributes to the development of technical thinking. This indicator of development is a progressive, but not stable, dynamics of the level of technical thinking.

3. Assessing students' success in subjects related to technical thinking cannot serve as an indicator of the development of this type of thinking, which is of professional importance for an engineer.

4. There is no equal clarity between the level of development of technical thinking and the level of inclination to activity in the field of technology. At the same time, the following personal relationships were identified:

5. Reflective analysis, which reflects the process of developing technical thinking, caused great difficulties for students: during the process of obtaining engineering information, questions regarding the nature of this thinking and ways to develop it were the most difficult.

6. The lists of subjects that develop technical thinking, compiled based on the answers of teachers and students, differ from each other, in particular, teachers do not pay attention to the importance of such

subjects as engineering graphics and computer science.

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