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METHODS OF INTERDISCIPLINARY INTEGRATION IN THE TRAINING OF SPECIALISTS IN THE FIELD OF CONSTRUCTION

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Abstract:

The article discusses the methodological features of organizing the educational process of a physics course in higher education institutions in the field of construction. Specific examples of the effective organization of lectures and practical classes in the training of civil engineers in physics are given. There are recommendations and suggestions on the need to pay more attention to demonstration experience in organizing lesson processes. Thanks to this, the features of student career guidance, interdisciplinary integration and specialization in the field of construction were studied.

Keywords

Physics course, construction sphere, civil engineer, interdisciplinary integration, demonstration experiments, practical classes, construction.

Introduction

Teaching physics in higher education institutions in the field of construction causes great difficulties due to the need to study extensive and complex material in a relatively short time. The hours allotted for studying the course are usually divided into three parts. These are: lectures, laboratory and practical classes. The lecture is the leading one among the various forms of organizing educational work on the course and at the same time acts as a teaching method. A prerequisite for the effectiveness of teaching physics classes is the development of student activity. Lecture classes create the basis for the formation of professional knowledge in future specialists, a conscious attitude to the educational process, obtaining independent knowledge and full mastery of the general physics course. Deep and thorough mastery of the physics course determines the professional training of future construction engineers. During the study of the physics course, students are required to master the knowledge provided by the state educational standard and be able to explain them, have the skills and qualifications to conduct demonstration experiments and laboratory work on the work specified in the program. . Thus, a successful systemic structure of teaching the physics course in higher educational institutions in the field of construction allows the student to form an idea of the place of physics in the system of scientific knowledge, as well as its importance in the chosen specialty of students, and in the future prepares him for the successful acquisition of scientific knowledge in special subjects.

The integrity of the educational process of training specialists in the field of construction is achieved through interdisciplinary integration. An interdisciplinary approach to education allows students to independently acquire knowledge in various fields of science and production, group them and direct them to solving specific professional problems. At the same time, the boundaries between courses and subjects are blurred, which allows students to form a holistic system of knowledge. The basic nature of physical knowledge suggests that the knowledge formed by students in physics classes at higher educational institutions is the basis for studying general technical and special sciences, mastering new equipment and technologies. The content of the physics course should contribute to the formation of students' ideas about the modern physical perception of the world. At the same time, physical knowledge is rounded off and a general methodology for constructing taught subjects is combined, focused on interdisciplinary connections.

Physics is important in the field of architecture and construction. Physical concepts help to better understand the stability, strength and rigidity of a building structure. Even the systems of internal and external lighting of buildings and structures cannot be explained without knowing the simplest laws of physics. There is even a science called resistance of materials, devoted to methods of calculating the strength, rigidity and stability of a structure. This science is also based on the laws of physics:

• strength is the ability of a structural element to withstand destruction under load;
• rigidity is the ability of a structural element to resist deformation;
• stability is the ability to withstand deviation from a state of equilibrium.

Lectures should be presented from the point of view of modern applied physics, that is, demonstrate the main directions of application of knowledge gained in physics in future professional activities and be accompanied by a sufficient number of examples of their practical application. Practical examples should be understandable to students. In the process of presenting theoretical material, more attention should be paid to the practical application of some of the concepts studied. Below are examples of construction demonstrations and practical classes.

1- Test experiment:

For the first demonstration experiment we will need two A4 sheets, glue and books. We roll two sheets into a tube and fasten them with glue. Next we install the tubes vertically and place weights using books of more or less suitable weight. In this process we find that the more books we put in, the more the tubes bend and change their appearance. (Pic. 1.)

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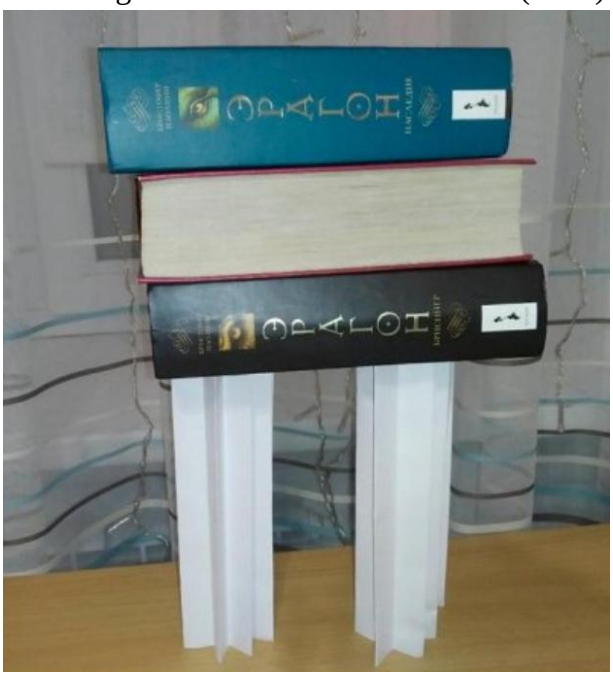
Pic.1

2-Test experiment:

For the next demonstration experiment we will need more glue, two A4 papers and books. Form two sheets of paper into an accordion and glue them together. Then, as in the first experiment, we put them vertically and place the books. In the experiment we have seen that this design can withstand greater loads than the first one. (Pic.2)

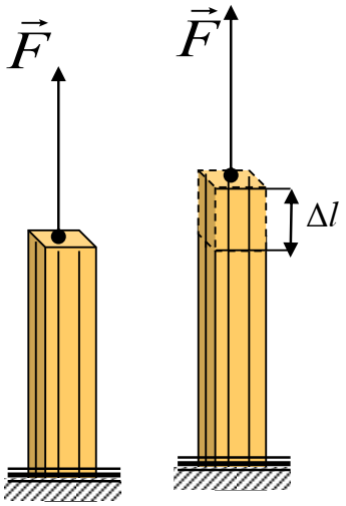


Picture 2.

So, we come to the conclusion that the strength and stability of the structure also depends on its shape. In practical classes, a set of specially developed and selected professionally

oriented tasks should be used. Such tasks are the main practical direction of teaching physics. Below is a question directly related to the field of construction from physics.

What should be the cross-sectional area (in m2) of a piece of wood (hammer) of constant cross-sectional area with a relative deformation of 0.02 during the construction of a private low-rise house so that it can withstand an elastic force of 2000 kN (Pic. 3).



As is known, Young's modulus- E=12•10⁹ for wood is equal to According to Hooke's law

$$\sigma = E \cdot \varepsilon$$

Based on the expression for determining mechanical stress, we determine it.

$$\sigma = \frac{F}{S}$$

We equate the mechanical stresses in the expressions given above and find the value to be determined:

$$\frac{F}{S} = E \cdot \varepsilon$$

$$S = \frac{F}{E \cdot \varepsilon}$$

Substituting the known values into the expression above, we determine the surface area of the wood (hammer),

$$S = \frac{F}{E \cdot \varepsilon} = \frac{2 \cdot 10^6}{12 \cdot 10^9 \cdot 0{,}02} = 0{,}0083 \text{ m}^2.$$

Thus, the cross-sectional area of wood (hammer) should be equal to.

Using such questions in practical classes increases students' interest in science and ensures interdisciplinary integration.

Specific examples of the effective organization of lectures and practical classes for students on career guidance are given, taking into account the features of their specialization in the

field of construction. Also, a feature of the professional training of students in construction specialties is not only the acquisition of new knowledge in physics, but also an increase in their need to use the acquired physical knowledge in future professional activities due to proper organization. Students' knowledge of physics will be strengthened through demonstration experiments and practical examples presented above. As a result, the future civil engineer understands the close connection between physics and construction, and the level of students' orientation towards the profession increases.

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