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METHODOLOGY FOR DEVELOPING ENGINEERING SKILLS OF STUDENTS THROUGH SOLVING EXPERIMENTAL PROBLEMS

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ABSTRACT:
This article provides information on the methodology of developing engineering skills of students of technical universities by solving experimental problems.
KEY WORDS: Technical universities, experimental issues, engineering skills, pedagogical technologies, practical knowledge.

МЕТОДИКА ФОРМИРОВАНИЯ ИНЖЕНЕРНЫХ НАВЫКОВ СТУДЕНТОВ ПУТЕМ РЕШЕНИЯ ЭКСПЕРИМЕНТАЛЬНЫХ ЗАДАЧ

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АННОТАЦИЯ
В статье представлена информация о методике формирования инженерных умений студентов технических вузов путем решения экспериментальных задач.

Ключевые Слова: Технические вузы, экспериментальные вопросы, инженерное мастерство, педагогические технологии, практические знания.

INTRODUCTION

Students of construction and installation of engineering communications require practical experience and solving experimental problems as an important tool for applying theoretical knowledge to real life, strengthening engineering skills and developing problem-solving skills. The first step in solving experimental problems is to define clear goals. The goals should be to improve students' engineering skills, improve their understanding of specific areas, and develop their ability to effectively solve problems and solve problems. Goals should be clearly defined, measurable, and address relevant issues [1].

RESEARCH MATERIALS AND METHODOLOGY

Problem selection is important in stimulating students' interest, broadening their knowledge, and aspiring to advance their engineering experience. Problems should be chosen in such a way as to allow independent thinking and creativity in harmony with the interests and aspirations of the students.
Solving experimental problems includes practical activities and experiences that are important for students. At this stage, students should learn how to create experiments, work with methods, get acquainted with the necessary tools and equipment [3].

In the process of solving experimental problems, students should focus on improving their engineering skills and abilities. They must learn to express their ideas effectively, critically analyze their experiences, and consolidate their findings to strengthen their problem-solving skills.

After completing the experiments, students should analyze the collected data, apply statistical methods, if applicable, and present the results effectively. This stage allows students to draw meaningful conclusions from their experiments and strengthen their understanding of engineering principles. Encouraging cooperation among students in the process of solving experimental problems encourages teamwork, communication and knowledge sharing. Students should reflect on their experiences, participate in discussions, and learn from each other's perspectives. This fosters a supportive learning environment and encourages personal and professional growth [2].

RESEARCH RESULTS

In order to effectively form and develop students' engineering abilities and skills, the following psychological-methodical features should be taken into account when teaching physical science in the areas of construction and installation of engineering communications:

demonstrate engineering thinking in finding the main solution to a selected problem;

formation of engineering ability in grouping problems from simple analysis and synthesis to complex, from part to whole, or through systematic principles;

grouping of the content and structure of issues through logical, i.e. inductive and deductive thinking;

selection of experimental issues - to ensure gradual, sequential complexity and generalization of construction methods;

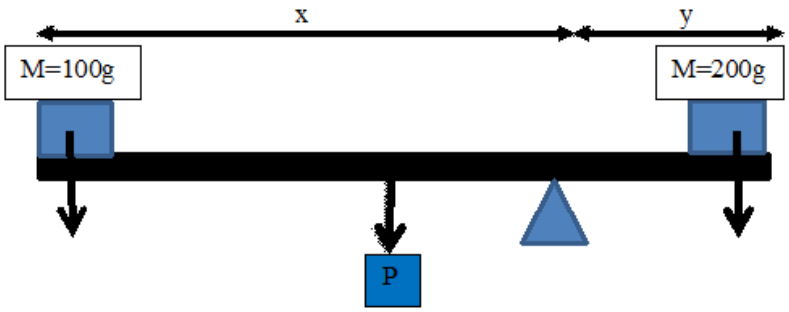
development of a unified system of requirements for engineering skills and their control [5].

They are perfected by analyzing and making proposals for practical exercises on choosing and composing problems and solving them. The use of modern approaches to the selection, formulation and solution of problems in the analysis of training. In the process of organizing independent practical activities, including in the process of selecting and solving physical problems of interdisciplinary integrative content, it is necessary to pay attention to the characteristics of individual formation of students, engineering ability [4].

The process of choosing and solving different types of problems is related to the psychological and methodological features of the ability to think and apply the general theories and laws of physics. Solving a simple physics problem of moderate difficulty requires the student to apply his knowledge of mathematics, chemistry, biology, drawing, and military sciences in an integrative manner. In addition, based on the condition of the issue, the ability of the student to have professional and technical thinking and imagination is also considered necessary. Below is an example of solving an experimental problem.

Sample problem solving. Stones of mass 100g and 200g are hung at both ends of a one-meter line. If the ruler has a mass of 100g, where should it be supported to keep it in balance?

Given
l=1m
m_1=100gr=0,1kg
m_2=100gr=0,1kg
M=100gr=0,1kg
Δl - ?



We use the law of moments to solve this problem. Right turning moments $M_1 = P_2 \cdot x(1)$ and left-turning moments $M_2 = P_1 y + P_0(\frac{l}{2} - x)(2)$ if we equate these moments $P_2 \cdot x = P_1 y + P_0(\frac{l}{2} - x)$ if we solve these cases systematically

$\begin{cases} P_2 \cdot x = P_1 y + P_0(\frac{l}{2} - x) \\ x + y = 1 \end{cases}$ (3) in this system, it is possible to get the result by putting numerical values of gravity forces.

$\begin{cases} y + \frac{l}{2} - x = 2x \\ x + y = 1 \end{cases}$ from this $\begin{cases} y + \frac{l}{2} = 3x \\ y = 1 - x \end{cases}$ if we look for a solution by replacing the system $1 - x + \frac{l}{2} = 3x$ an equation is formed, if we solve this equation

$$4x - \frac{l}{2} = 1$$

$$x = \frac{2 + l}{4}$$

$l = 1$ considering that $x = \frac{2+1}{4} = 0,75$ it follows that $x + y = 1$ if we find the value of y by considering that $y = 0,25$ it turns out that.

So, in conclusion, we can say that the lever is a support for balance m_2 from the load end $y = 0,25m$ should be placed at a distance.

Solving these types of experimental problems should be viewed as an integrative learning process that allows students to apply their engineering skills to increasingly complex tasks. During the course of study, students will need to solve more experimental problems in order to build on their previous knowledge and gain a deeper understanding of engineering principles.

DISCUSSION

The analysis of the condition of the experimental problem allows to develop engineering skills, as a result of which it forms the unity of the sequence of operations, actions, that is, forms the algorithm for solving this type of problems in the directions of construction and installation of engineering communications. Educational problems with experimental content, on the one hand, implement didactic integration of knowledge in natural sciences, on the other hand, if experimental problems have

an engineering content and structure, then general professional and specialized educational subjects Didactic integration of knowledge takes place. As a result of performing and comparing analysis-synthesis operations in the process of solving experimental problems, students develop their engineering abilities and skills [3].

By following this methodology, students can effectively approach experimental problems in physics, develop critical thinking skills, improve their understanding of physical principles, and contribute to the development of scientific knowledge.

CONCLUSION

The methodology of developing engineering skills by solving experimental problems gives students invaluable hands-on experience, develops their problem-solving skills, and prepares them for real engineering problems. By following a systematic approach that includes problem selection, experimental design, data analysis, and collaboration, students can significantly improve their engineering skills and become proficient in applying theoretical knowledge to practical situations. This methodology allows students to develop critical skills necessary for success in engineering careers.

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