The Importance of Practical Issues in the Development of Professional Competence of Students of Technical Higher Education Institutions

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ABSTRACT
This article reveals the purpose of developing students' professional competence based on a problem-based approach in solving and analyzing scientific, technical and professional problems that arise in the process of teaching students of technical higher education institutions to ensure and control the quality of education.

Keywords: Education, activity, problem, problem approach, methodology, analysis, synthesis, competence, professional competence, mathematical intuition, search and research, component, function

Introduction

To effectively develop the professional competence of students of technical higher education institutions, it is divided into practical issues and issues of a professional nature by using a problem-based approach. By solving these types of problems, students develop logical thinking, mathematical expression of technical problems, mathematical intuition, mathematical modelling methods for solving professional problems, and creativity [2].

Results

In studies and literature, the concept of the practical problem is interpreted differently. Some researchers believe that a problem that requires conversion from a natural language to a mathematical language is practical, while others believe that a practical problem should be practical, that is, closer to problems that occur in practice, according to its expression and solution methods.

A problem-based approach is a broad expression of the teaching content of various educational tasks. Among them:

a) a problem that the student understands one or another educational problem based on its solution;
b) a sequence of issues representing the stages of solving a given problem situation;
c) research-related issues to be solved independently by students;
d) practice questions of a reinforcing nature (in relation to the theoretical material).

The problem puts the learner in front of the need to independently complete the work on the formation of a certain system of knowledge, skills, and abilities, and thereby encourages him to consciously and actively understand the mental schemes and rules of the approach. At the same time, the content of the problem and its solution requires knowledge from special disciplines. Solving practical problems helps students to develop their ability to realize their ideas [3].

Discussion

The process of solving the problem is carried out with the use of a set of operations necessary for thinking: comparison, analysis and synthesis, abstraction and generalization. Comparison leads to the classification of events and knowledge. Analysis and synthesis do not complete the act of thinking. Its important aspects are abstraction and generalization [7].

In the professional activities of students of technical higher education institutions, together with fundamental sciences, the dynamics-kinematics issues of theoretical mechanics, issues related to bending and buckling in the resistance of materials, issues related to energy efficiency in energy, the theory of geodetic measurements in the field of construction, and several similar issues in professional activities are issues mastered from fundamental sciences. is solved based on knowledge of solving [2].

Determining the law of motion of a material point when the acting forces are known is considered a classical problem of point dynamics, and depending on the acting forces, various types of equations are formed. Many of these problems are mechanical problems, the solution of which leads to a differential equation via Newton's second law.

The development of energy is related to the continuous increase in the production of electricity. Because the generation, transmission, distribution and use of electric energy have become easier, it is the most widely used basic energy by people today. Contour current method (CCM) is one of the easy ways to calculate interconnected circuits. This method is explained with the help of a scheme.

Let the following scheme be given for calculation:

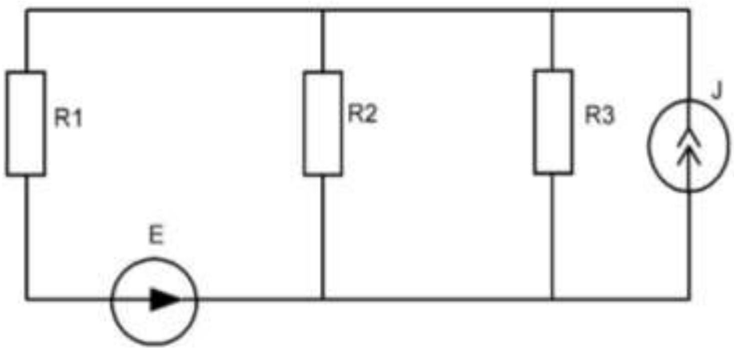

Fig. 1.

We can arbitrarily choose the current directions of the resistors in the given scheme. In addition, we can choose the direction of the contours arbitrarily. When choosing the direction of contours and currents, it is recommended to choose the direction of the given EYuK. We mark each contour with capital letters of the Latin alphabet. Thus, we select the direction of the contour and currents in the scheme:

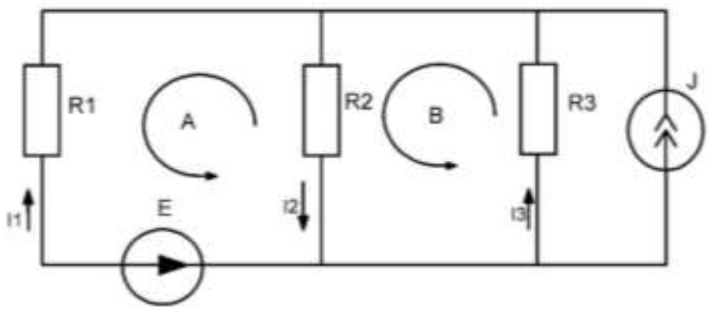

Fig. 2.

After determining the contour and the direction of the currents, we draw up the equations. For this, we use Kirchhoff's second law. A is multiplied by the current of this circuit (I_A)) by adding together the resistances in the circuit. After that, we multiply the resistance R_2 connecting the adjacent circuit V by this circuit current. We choose the sign between them depending on the direction of the contours. We assume that currents I_A, I_B flow in each circuit.

$$I_A \cdot (R_1 + R_2) - I_B \cdot R_3 = E$$

Thus, we construct the same equation for the V contour:

$$I_B \cdot (R_3 + R_2) - I_A \cdot R_1 = R_3 \cdot J$$

We construct a system of equations using both equations:

$$\begin{cases} I_A \cdot (R_1 + R_2) - I_B \cdot R_3 = E \\ I_B \cdot (R_3 + R_2) - I_A \cdot R_1 = R_3 \cdot J \end{cases}$$

We find the unknowns (I_A, I_B) in the system of equations using the Gaussian method. For this, we make the following changes to the system of equations:

We assume that $R_1 + R_2 = Z_1, R_3 + R_2 = Z_2$ and $R_3 \cdot J = E_1$, and the system will look like this:

$$\begin{cases} I_A \cdot Z_1 - I_B \cdot R_3 = E \\ -I_A \cdot R_1 + I_B \cdot Z_2 = E_1 \end{cases}$$

After entering the notation, we continue the calculation:

$$\Delta = \begin{pmatrix} Z_1 & -R_1 \\ -R_1 & Z_2 \end{pmatrix} = Z_2 \cdot Z_1 - (-R_1 \cdot (-R_1));$$

$$\Delta I_A = \begin{pmatrix} E & -R_1 \\ E_1 & Z_2 \end{pmatrix} = E \cdot Z_2 - E_1 \cdot (-R_1);$$

$$I_A = \frac{\Delta I_A}{\Delta};$$

$$\Delta I_B = \begin{pmatrix} Z_1 & E \\ -R_1 & E_1 \end{pmatrix} =\cdot Z_1 \cdot E_1 - E \cdot (-R_1);$$

$$I_B = \frac{\Delta I_B}{\Delta};$$

Thus we found unknown contour currents. It can be used to find all currents in the network. Since the direction of the current in the first network A is opposite to the direction of the circuit, it is taken with a minus sign:

$$I_1 = -I_A;$$

The direction of the current of the second network is taken with a positive sign since V corresponds to the direction of the contour, and with a negative sign since it is opposite to the direction of the contour:

$$I_2 = I_B - I_A;$$

The direction of the third network current is taken with a positive sign to correspond to the direction of the coil V:

$$I_3 = I_B;$$

The importance of such tasks is that teaching students to solve problems of practical and professional importance leads to the formation of mathematical modelling methods in their minds, and students observe the effective application of basic concepts and knowledge of fundamental sciences in solving life and professional practical problems, and their creative abilities are developed [3].

Methodological significance is that, during their implementation, students not only have a stable interest in fundamental knowledge, but also the need to apply real content issues to their solution, and it shows that in order to ensure the effectiveness of teaching fundamental knowledge to students, it is necessary to establish interdisciplinarity and develop it [1-6].

In addition to the tasks performed, the optional question represents a structure, based on which various classifications are made [7]:

– structural-component composition of issues;
– activity components;
– the novelty of the building component of the activity;
– type of thinking activity of the subject in solving the problem;
– functional characteristics of issues, etc.

L.M. Friedman's classification [6-14] emphasizes the structural components of the lesson that can be applied to problems (motivation, presentation of new material, formation of skills and competencies, etc.). Methodologically, A.D. Semushkn and K.I. Neshkov distinguishes the following types of problems [5-9]:

– issues with a didactic function;
– functional issues of cognition;
– developmental functional issues.

In modern didactics, methodologists such as Yu.M.Kolyagin, J. Ikromov and N. Gaibullaev divide the functions of problems and examples into the following types [4-9]:

1. The educational function of the matter;
2. The educational function of the matter;
3. Developmental function of the issue;
4. The function of the investigation character of the problem;

Let's look at these functions separately:

1. The educational function of the subject is realized through the formation of solid fundamental knowledge and skills as a result of the application of the learned theoretical information, concepts and conclusions to specific problems or examples.
2. The educational function of the matter forms and develops the scientific worldview, as well as educate them in the spirit of love for cocktails.
3. The developmental function of the problem develops the activity of logical thinking. It is known from psychology that the activity of logical thinking is carried out through thinking operations (comparison, analysis-synthesis, generalization, clarification, abstraction and classification) [4-14].
4. The investigative function of the issue includes:

1) The level of students' theoretical knowledge;
2) application of the acquired theoretical knowledge to solving practical examples and problems;
3) levels of inference;
4) levels of development of logical thinking competencies;

Conclusion

By solving professional-practical problems, students develop practical knowledge characteristic of creative approaches. Completing these tasks requires mastering knowledge at the basic level, helps the development of meaningful memory and ensures the assimilation of evidential material. In this, students develop logical thinking, and skills of applying basic knowledge in a non-standard situation are formed. In order to implement the principle of fundamentalization of the process of developing professional competence, we emphasize the importance of teaching based on a problem-based approach and suggest using professional-practical issues in teaching.

In short, we can see that the importance of practical issues in the development of students' professional competence is formed in students by solving engineering problems in mathematics and creating mathematical models for conducting research in the field of technology.

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