Solving Problems in Physics in the Training of Technical Engineers and Connecting Its Efficiency to a Competent Approach

O'.N.Sultanova - Associate Professor

N.T. Qodirova – Associate Professor

S.I. Jiyanova – Assistant of

Termez branch of Tashkent State Technical University named after Islam Karimov

Annotation: In this article, a methodology for solving the following problems has been developed and applied in practice, with high efficiency achieved during the course. This requires the active use of teaching methods, the widespread use of non-traditional forms and methods of education, the study of objects and phenomena on the basis of their interconnectedness, movement and development. In particular, it is necessary to increase the activity of students in solving problems, the acquisition of new knowledge, the formation and development of their learning and skills, increase the efficiency and effectiveness of the process of studying physics in general. Thus, it is ensured that the formation of personal competence of students as a result of education, which ultimately creates the necessary conditions for the full development of students at different stages of continuing education.

Keywords: Technical specialist, measuring instrument, method of motion, electromagnetic competence, algorithm method, heuristic method

Relevance and necessity of the topic: On the basis of 5 important initiatives adopted by the President and the Strategy of further development of the Republic of Uzbekistan, it is important to continue the policy of further improving the system of continuing education, increasing access to quality education services. identified as a priority. Therefore, it is important to train future technical specialists on the basis of a competency approach, to create innovative activities, to teach physics on the basis of a competent approach and to develop and apply methods of problem solving to increase the effectiveness of lessons.

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Aims and objectives of the topic: In the article it is important to learn how to apply the knowledge acquired by students in the classroom and in the classroom, to learn and work to solve problems of various difficulties. Therefore, to increase students' interest in solving problems in the classroom and in the classroom; its solution is to express the student's identity through problem solving, overcoming difficulties, being active and positive, and creating innovations. There are theoretical and practical methods in teaching physics, the main of which are problem solving. In the process of solving problems, along with imparting knowledge to students, it is important to form communicative, mathematical literacy, self-development competencies, to develop their abilities, to educate them. In the process of solving problems in physics, technical specialists become more interested in their profession, expand their logical thinking, develop creative and scientific research, and develop their abilities. They have a broader understanding of the fundamental nature of physical phenomena, understand the practical application of the laws of physics, have a deeper understanding of the fundamental nature, learn to apply their laws in practice. For example, from the phenomenon of electromagnetic induction, transformers learn the principles of operation of generators, understand how important they are for practice. qualities such as willpower are nurtured.

It is impossible not to use practical and technical issues in the educational process to increase the interest of future technical students in physics and the formation of basic competencies. By solving such problems, students develop the ability to think logically, to observe. Technicians learn to think critically and analyze the results obtained.

The solution of problems of non-standard description in the IV-V difficulty of physics is not immediately found, but with several attempts and difficulties the result is achieved, the student begins to achieve important qualities such as endurance, diligence, strong will.

It is important for the student to enjoy the feeling that the main thing is that the result is achieved with difficulty, that the solution is not traditional. Dealing with logical, interesting issues that are more complex than physics allows prospective technicians to repeat the concepts they have learned in a deeper study of the science. Hence, the introduction of these types of issues leads to basic competencies, the realization of their unique talents. Depending on the content of the issues are divided into sections of mechanics, molecular physics, electromagnetic, optics, atom, nucleus, each of

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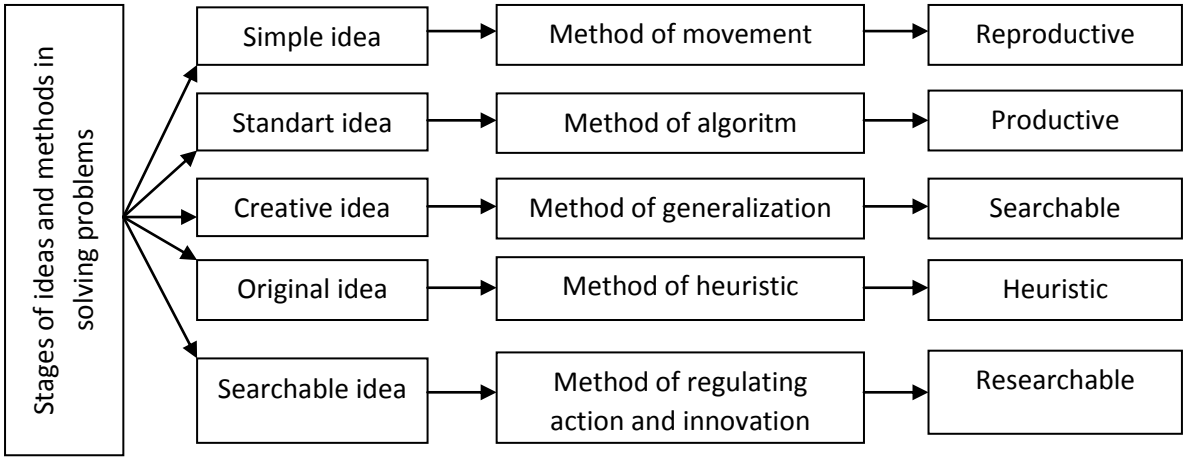
which differs in terms of content, level of complexity. These issues are goal-oriented and can be addressed in a variety of ways.

Table 1



Issues can be divided into two types according to their nature. Creative issues;non-creative issues.

A creative problem encourages the student to think independently, to think logically, to fully understand the content of the problem, this type of problem differs from other types of problems by the level of complexity. V.G. Razumovsky points out that what is unknown to the student is a creative issue. In the process of solving a creative problem, students should not separate the conditions, requirements and methods of solving the problem when thinking independently, and to solve the problem independently, refer to previously solved problems, if they are not satisfied with clear answers, enters. I.Ya. Lerner's creative problem differs from the non-creative problem in that the student achieves results that are new to him in the process of independent work, resulting in a novelty of thinking. Creative - in solving problems, it is necessary to acquire new knowledge in advance.

It should be noted that if the system of selected issues, as well as each issue meets the following requirements, the educational and pedagogical significance of such an issue will be significant:

1. What knowledge should students have so that they can solve the problem independently. 2. The issue should be interesting for the student. 3. What educational and scientific significance in the matter. 4. Know how issues differ from each other. 5. Each issue has a clear purpose. 6. Know how much the teacher will help the

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student. 7. To know what the student has achieved in creative research and problem solving. 8. Know that the issues are interrelated.

In particular, it is planned to form in students the following competencies in physics on the approved STS for the higher education system.

1. Competence to observe, understand and explain physical processes and events.

2. Competence to conduct experiments, measure physical quantities and draw conclusions.

3. Competence to use physical knowledge and tools in practice.

In the formation of these competencies in students, it is important to solve "typical problems" focused on practice. To do this, using physical knowledge, it is necessary to identify typical problems related to solving such problems encountered in everyday life and teach students how to solve them.

Here are some of the typical issues that apply the knowledge they have acquired from physics in the problems faced by human daily life.

1. Soil moisture for houseplants should always be within a certain range. When you go on vacation and go somewhere else to relax, work out a design that retains that moisture.

2. There are power outages in many places. What can be done to prevent spoilage of products in the refrigerator?

3. Think of a device that closes the front door slowly (for children) without using much force.

4. Offer a device that notifies you in a pleasant voice that a newspaper or letter has been placed in the mailbox.

Development of problem-solving technology.

1. In most refrigerators, the freezer compartment is thickly covered with snow and ice. Think of a way to defrost it quickly.

2. It is known that tears flow from the eyes when the onion is sliced. Suggest ways to get rid of it.

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3. The roads outside are frozen. Recommend safety techniques for commuting from home to school (college)?

4. The measuring limit of the scales in your home is 5 kg. So how do you measure something that weighs 10 kg?

5. You want to move heavy furniture in the house from one place to another. In doing so, suggest a way to reduce friction.

6. Suggest methods to slow down liquid evaporation.

Elimination of deviation of parameters from the established norm.

1. How can I check if there is a short circuit in the kettle? 2. If the humidity in your room is high, how can it be normalized? 3. How to get rid of unpleasant odors from pets?

Find or evaluate descriptive physical parameters in a given case.

1. A man standing in Zhukovsky's chair holds a ball with a mass of 0.4 kg, flying fast in a horizontal direction with $20\,{}^{m}\!/_{s}$ speed. The trajectory of the ball passes at a distance of 0.8 m from the rotating vertical axis. If the sum of the moments of inertia of the man and his chair is equal to $6\ kgm^2$, what is ω the angular velocity at which the Zhukovsky chair rotates with the man holding the ball?

Given:

$\omega_0 = 0;$
$\vartheta = 20\,{}^{m}\!/_{s};$
$m = 0{,}4kg;$
$r = 0{,}8m;$
$J = 6kgm^2.$

$\omega = ?$

Solution: We write the law of conservation of momentum for a ball and man-course system

$$J\omega_0 + J_T\omega_T = J\omega + J_T\omega = (J + J_T)\omega, \quad (1)$$

Here J – the total moment of inertia of the person and the course, ω_0 - the initial angular velocity, J_T -the moment of inertia of the ball, ω_T - the angular velocity of the ball.

If we look at the ball as a material point

$$J_T = mr^2. \quad (2)$$

The angular velocity of the ball is expressed by the linear velocity

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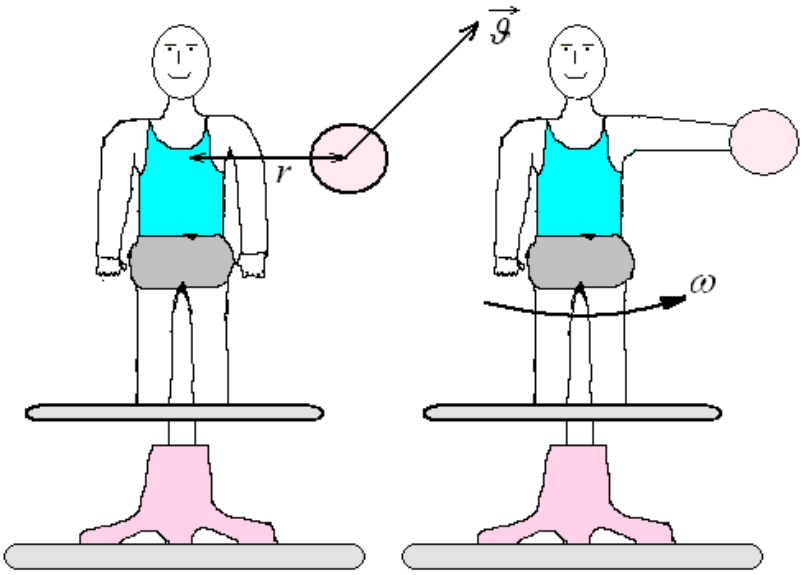
$$\omega_T = \frac{\vartheta_T}{r}. (3)$$

Substituting (2) and (3) into (1) and considering, $\omega_0 =$ obtain the following

$$\omega = \frac{m\vartheta_T r}{J + mr^2}. (4)$$



Picture 1.

Let us check the unity of ω by using (4)

$$[\omega] = \frac{[m][\vartheta][r]}{[J]} = \frac{1kg \cdot 1\frac{m}{s} \cdot 1m}{1kg \cdot m^2} = 1s^{-1}.$$

We put the given ones in (4) after making sure that the angular velocity unit is formed

$$\omega = \frac{0,4 \cdot 20 \cdot 0,8}{6 + 0,4 \cdot (0,8)^2} s^{-1} = \frac{6,4}{6 + 0,26} s^{-1} = \frac{6,4}{6,26} s^{-1} = 1,02 s^{-1}.$$

Result: $\omega = 1,02 s^{-1} = 1,02 \frac{rad}{s}$.

2. The difference in fluid levels at the elbows of the U-shaped tube is 23 mm. The diameters d_1 and d_2 s of the duct elbow channels are 2mm and 0.4mm, respectively. The density of the liquids is 0.8 g / cm^3; Determine the coefficient of surface tension σ of liquids.

Given:

$\Delta h = 23mm = 23 \cdot 10^{-3} m;$
$d_1 = 2mm = 2 \cdot 10^{-3} m;$
$d_2 = 0{,}4mm = 4 \cdot 10^{-4} m;$
$\rho = 0{,}8\, g/sm^3 = 800\, kg/m^3.$

$\sigma = ?$

Solution: difference of surfaces

$$\Delta h = h_2 - h_1 \qquad (1)$$

We find out from the expression. If we use a formula for each elbow, which determines the height of the rise of fluid from the capillary tube

$$\Delta h = \frac{2\sigma \cos\theta}{\rho g R_2} - \frac{2\sigma \cos\theta}{\rho g R_1} = \frac{2\sigma \cos\theta}{\rho g}\left(\frac{1}{R_2} - \frac{1}{R_1}\right)$$

we get If we assume $\theta = 0, \cos\theta = 1$ that the surface of the fluid in the elbows is upright,

$$\Delta h = \frac{2\sigma}{\rho g}\left(\frac{1}{R_2} - \frac{1}{R_1}\right) \qquad (2)$$

It will occur. Here $g = 9{,}8 m/s^2$ -free fall acceleration

If we find σ (2) and assume $R = \frac{d}{2}$ that it is stained

$$\sigma = \frac{\rho g \cdot d_1 d_2 \Delta h}{4(d_1 - d_2)}. \qquad (3)$$

Let's check (3) using dimensions

$$[\sigma] = \frac{[\rho][g][d][d][h]}{[d]} = [\rho][g][d][h] = 1\frac{kg}{m^3} \cdot 1\frac{m}{s^2} \cdot 1m \cdot 1m = 1\frac{kg\frac{m}{s^2}}{m} = 1\frac{N}{m}$$

we put the numerical values of the quantities.

$$\sigma = \frac{800 \cdot 9{,}8 \cdot 2 \cdot 10^{-3} \cdot 4 \cdot 10^{-4} \cdot 23 \cdot 10^{-3}}{4(2 \cdot 10^{-3} - 4 \cdot 10^{-4})} \frac{N}{m} = \frac{3606{,}4}{1{,}6} \cdot 10^5 \frac{N}{m} = 22{,}54 \cdot 10^{-3} \frac{N}{m} = 22{,}54 \frac{mN}{m}.$$

Result: $\sigma = 22{,}54 \frac{mN}{m}$.

Scientific and practical significance of the topic: Solving technical problems in physics develops students' interest in their field, creative thinking skills, problem-solving and analysis and development, strengthening of its implementation.

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Introduction of the topic result:

Suggestions and recommendations: Competence of independent creative work in the study of design experimental teaching materials in the teaching of physics of future technical engineers. Effective organization of independent work in the classroom and outside the classroom. and serves to increase the practical significance.Experimentalexperiments were analyzed through a competent approach to physics. The teaching of physics through a competency-based approach reveals the effectiveness of non-traditional methods compared to the traditional approach. As a result of research and experimental research, a methodology for teaching physics on the basis of a competency-based approach has been developed and approved to increase students' knowledge, methodological recommendations and manuals are produced.

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