ISSN NO: 2770-2367
Date of Publication: 25-11-2023

The Use Of Non-Standard Tasks In Teaching Physics In The System Of Continuing Education

Baratov Jurakuzi Shukurjon ogli
PhD, Senior Lecturer, Tashkent State Technical University, Tashkent, Uzbekistan
E-mail: baratovjoraqozi@gmail.com

Abstract
This article is devoted to improving the application of non-standard tasks from the physics course in the formation of the professional training of future pedagogues in higher educational institutions of pedagogy, selecting and applying them to the educational process based on science programs and syllabuses, developing the level of knowledge of students, expanding their range of thinking, reflecting interdisciplinarity, science it is important to increase interest in and develop professional training. The methodical system of science is improved in students by reviewing the problems, tests and non-standard tasks related to the Department of Molecular Physics and Mechanics.

Keywords: topic-related problem, test, graph, single-choice tests, multiple-choice tests, conclusion, interpretation of written answers, analysis and conclusions based on the answers found, and formation of professional training.

Introduction

In the Republic of Uzbekistan, continuous education is the basis of the personnel training system, a priority area that ensures socio-economic development, meets the scientific-technical and cultural needs of the individual, society and the state, and is a creative, socially active, spiritually rich person creates the necessary conditions for the formation and rapid training of highly qualified competitive personnel. In fact, the process of continuous education is considered the most favourable period for a person to make a comprehensive decision. During this period, a person learns the basics of science and professional information, and matures as a person with high moral and ethical qualities and as a qualified staff. A certain worldview is formed in it. It is known that education - upbringing allows a person to understand the secrets of the realization of existence, to adapt to the constantly developing world, to form a worldview, and finally to contribute to the humanization of society. The power and level of development of any country is determined by the education system. The attitude of the state to this system determines its future. Today, continuing education in the Republic of Uzbekistan includes the following types of education:

- preschool education;
- general average;
- secondary special education;
- professional education;
- higher education;
- post-secondary education;
- improvement of staff qualifications and their retraining;
- extracurricular education.

In the Republic of Uzbekistan, several activities are being carried out at each stage of such a types of education system. Such works can be evaluated as an unprecedented development for a historically short period. Such a rapid development seems to be enough for today. However, any innovation prompts the introduction of another innovation.

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Methodology

The system of 11-year general secondary education, academic lyceum and technical schools has been formed in our republic, and their role in training personnel is incomparable. In addition, the issues of integrity and continuity in the education system are considered at a high level, and the functions of its components are clearly defined and it is required to ensure the systematic performance of the tasks set before it. Usually, the fulfilment of state requirements is assessed through a statistical system. Although such a statistical view and evaluation is distinguished by its several advantages, it does not allow looking carefully at some situations that may occur in dynamic systems. It can be seen that there are several problematic issues in ensuring the quality of the continuing education system.

Including:

Why does a child in the first grade of school have difficulty adapting to lessons and mastering the subjects given in the science program?

Why does a child who gets good grades in primary education fail in higher grades?

Why can't a student make an independent choice when choosing a profession?

Why can't those who have completed higher education quickly enter professional activity?

As an answer to such questions, it can be shown that continuity is not ensured in the continuous education system. The lack of continuity of science programs in the continuing education system has a negative impact on the quality and effectiveness of education. In particular, there are problems such as the repetition of interdisciplinary subjects, too many hours allocated to some subjects, the fact that the content of the subject is almost based on theoretical information and international studies are not absorbed. In the analysis of the content of educational stages, it was seen that 10-15% of topics are repeated, 50-60% of topics lack coherence.

The role and importance of non-standard tasks in ensuring the continuity of the above-mentioned educational system is very important. For example, the development of the professional activity of future teachers who are growing up in higher educational institutions of pedagogy is very important. The development of professional activity and the growth of future activity greatly contribute to the integrative connection of all stages of continuous education.

By solving non-standard problems in the physics course of the future teachers of pedagogical higher educational institutions, the interdisciplinary connection of students' worldviews and the connection of topics and topics lead to the development of continuous education.

Task 1:

Cart with mass M=9 kg ϑ moves with a constant speed of =2 m/s. A body of mass m=1kg is placed on its head, which is much smaller than its dimensions. If the coefficient of friction between the object and the trolley is 0.6, find the length of the trolley required so that the object does not fall off the trolley. (m)Assume there is no friction between the cart and the ground. g=10 m/s2 (see Figure 1)

Solution:

First, let's write the force acting on the cart and the body. For the body, the friction is in the direction of the cart, and for the cart, the friction is against its velocity. We apply Newton's second law.

For the stroller $MA = F_{ishq} = \mu N = \mu mg \rightarrow A = \mu g \frac{m}{M}$;

For the body: $ma = F_{ishq} = \mu N = \mu mg \rightarrow a = \mu g \frac{m}{m} = \mu g$;

The velocity equation for the cart is: $\vartheta = \vartheta_0 + At$; and for the body $u = at$

When their speeds are equal, they begin to act as a system and the body does not slide on the trolley.

$\vartheta = u \rightarrow t = \frac{\vartheta_0}{A + a}$;Substituting this value of time into any one of the speed equations, we get the following:

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$$\vartheta = u = \frac{a\vartheta_0}{A+a}$$

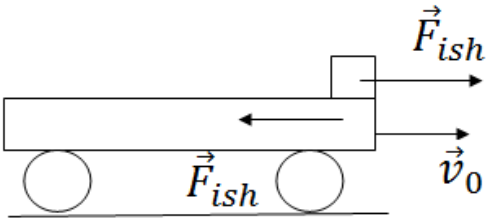

Figure 1.

The displacement of a wheelchair is different from the displacement of a body. their difference cannot be greater than the length of the stroller. Otherwise, the object will fall over the cart.
$S_1 - S_2 \le l;$

For distances covered $S_1 = \frac{\vartheta^2{}_0 - \vartheta^2}{2A}; S_2 = \frac{u^2}{2a}$ formulas and from expression (1) we get:

$$S_1 = \frac{(A+2a)\vartheta_0^2}{2(A+a)^2}; \qquad S_2 = \frac{a\vartheta_0^2}{2(A+a)^2}$$

Putting these expressions into (2):

$\frac{\vartheta_0^2}{2(A+a)} \le l$ or $l \ge \frac{\vartheta_0^2}{2\mu g\left(\frac{m}{M}+1\right)}$ we will have;

Calculate: $l \ge \frac{2^2}{2\cdot 0{,}6\cdot 10\left(\frac{1}{9}+1\right)} = \frac{4\cdot 9}{2\cdot 6\cdot 10} = 0{,}3m$

Task 2:
What is the minimum speed required to throw a stone at an angle to the horizon over a hemispherical object of radius R = 30 m? (m/s) g=10 m/s2 (see Figure 2)

Solution:
The movement trajectory of the stone is given in the figure. If we apply the law of conservation of energy for motion. The total energies at the initial time and at the highest point of the trajectory (A) are equal. In order for the initial velocity to be minimal, at the highest point of the trajectory, the stone must be on the highest surface of the hemisphere. So at point A it is only horizontal ϑ_x Get rid of the speed.

$$\frac{m\vartheta_0^2}{2} = \frac{m\vartheta_{\max}^2}{2} + mgR$$

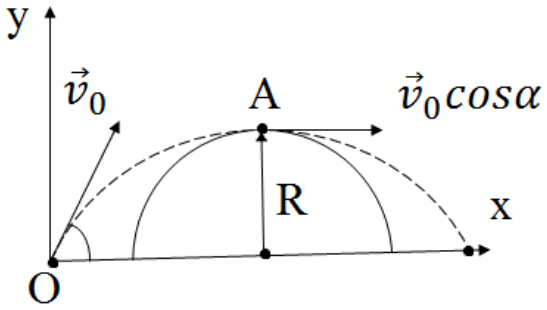

Figure 2.

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On the other hand, point A also belongs to the hemisphere. If we write the following equation for this point:

$\frac{m\vartheta_{max}^2}{R} = mg$ from

$\frac{m\vartheta_{max}^2}{2} = \frac{mgR}{2}$ and put it in (1).

$\frac{m\vartheta_0^2}{2} = \frac{mgR}{2} + mgR \rightarrow m\vartheta_0^2 = 3mgR \rightarrow \vartheta_0 = \sqrt{3gR}$

Calculate: $\vartheta_0 = \sqrt{3 \cdot 10 \cdot 30} = 30\frac{m}{s}$

Task 3:

In the figure below, M=10 kg, m=4 kg, and there is no friction on the horizontal surface and between the objects. Determine the acceleration of a small mass object when the system is released(See Figure 3).

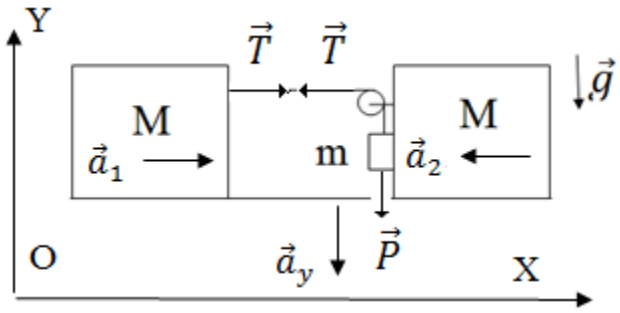

Figure 3.

Solution:

First, if we apply Newton's second law to each object:

For the first object of mass M: $Ma_1 = T$ (3.1)

For the second M and m on the Ax axis: $(M+m)a_2 = T$ (3.2)

For a body of mass m on the Moon axis: $ma_y = P - T$ (3.3)

Moreover, due to the displacement of bodies, if we take the coordinate of the first body as x1, the second body as x2, and the body of mass m as y. The length of the rope will be:

$(x_2 - x_1) + (y_2 - y_1) = L = const$

where y0 is the coordinate of the block on the Moon and u is a constant.

It is known that if there is no initial velocity, the coordinate is directly proportional to the acceleration:

$X = \frac{at^2}{2}$

From this: $(-a_2 - a_1) + (a_y) = 0 \rightarrow a_y = (a_1 + a_2)$

this a_2 on the ground a_y and the direction is opposite to the axes. Because of this, it is necessary to put a negative sign in front of them.

From the expressions (3.1) and (3.2) we find the following:

$a_2 = \frac{T}{m+M}$; $a_1 = \frac{T}{M}$ of these two expressions $a_1 + a_2 = \frac{T}{m+M} + \frac{T}{M} \rightarrow a_1 + a_2 = T\left(\frac{m+2M}{M(m+M)}\right)$

The last expression is also (3.4) a_y according to is also equal to:

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$$a_y = T\left(\frac{m+2M}{M(m+M)}\right)$$

If we find T from this and put it in (3.3):

$$ma_y = P - T = mg - T = mg - a_y\left(\frac{M(m+M)}{m+2M}\right) \rightarrow a_y\left(\frac{M(M+m)+m(M+m)}{m+2M}\right) = mg$$

Finally, we have:

$$a_y = g\frac{(m+2M)m}{M(m+M)+m(m+2M)}$$

Calculate:

$$a_y = g\frac{(4+20)\cdot 4}{10\cdot(4+10)+4\cdot(4+20)} = \frac{24\cdot 4}{(35+24)\cdot 4} = \frac{24g}{59}$$

Temperature

This assignment uses the relationship between molecular physics and the subject of botany.

Task 4:

Table 1

No	The name of the fruit	Picture	Germination temperature (°C)
	Melon		15
	Cotton		12
	Tomato		10
	Corn		8
	Cabbage, turnips, carrots		5
	Wheat		
	Peas, radish		2
	Alfalfa, rye		1

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Temperature dependence of seed germination

As we know, the rotation of the Earth around its core causes night and day. In addition to rotating around the core of the Earth, it also revolves around the Sun, making one complete revolution in a year. At this time, we know that the change of seasons takes place so with the arrival of spring, our grandfather farmers start planting seeds in the ground. When planting seeds, attention is paid to their biological properties. There must be a certain period and conditions for the seed to mature. After the seed is planted, it begins to absorb water, as a result of which the nutrients necessary for the grass dissolve, and the starch turns into sugar. This is the reason why sumac made from wheat grass is sweet. Depending on the size of the seeds and the germination conditions, they are planted at different depths. One of the factors necessary for seed germination is temperature.

Table 1 above describes the germination temperature and appearance of the seeds. It shows the interdisciplinary connection between botany and physics, that is, based on non-standard assignments, students are taught to think independently, and it provides an opportunity to apply the learned knowledge in life.

Question 1. You choose such plant (one-year) seeds from Table 1 so that their germination temperature numerical value forms an arithmetic progression.

Answer: In the table, the germination temperature of one-year plants (cotton +12 ℃, tomato +10 ℃, corn + 8 ℃) is number 8, 10, 12, which forms an arithmetic progression and the difference is equal to two.

For the germination of seeds of alfalfa, rye and similar perennial plants, the temperature should be at least +1 ℃. As the temperature rises, more plants can be planted.

Question 2. In Table 1, the germination temperature of some berry fruit is 10 times greater than the germination temperature of alfalfa, and the germination temperature of an annual multi-seeded plant is 12 times greater? (use the table above)

Answer: A berry fruit is a tomato, its germination temperature is +10 ℃, and cotton's germination temperature is +12 ℃

Question 3. In the given pictures below, a picture is given in place of the germination temperature of plants, find the correctness of the inequalities using the table.

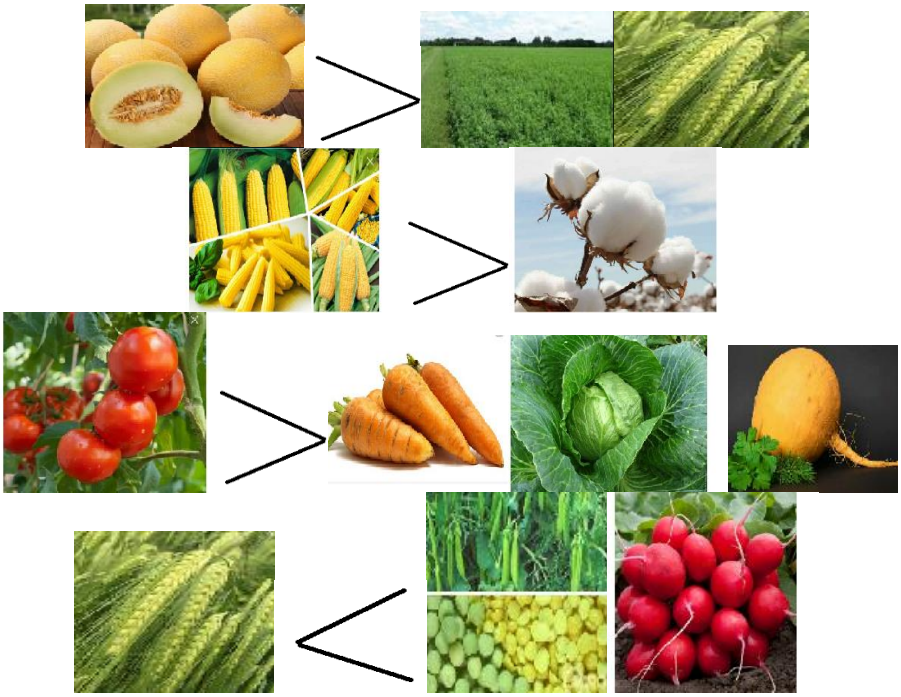

Figure 4.

Answer:1) true 2) false 3) false 4) true

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Task 5:
When a piece of ice was dropped into the water in an insulated container, it was observed that the ice mass increased.
Based on this, which of the following could be true?
I. The initial temperature of the water is 0°Cis equal to
II. The initial temperature of the water is 0°C higher than
III. The initial temperature of ice is 0°Cis equal to
A) only IB) I and II C) I and III D) I and II E) I, II and III

Conclusions
This article presents the method of applying and solving non-standard tasks in the continuous education system in the development of professional activity of future teachers. Non-standard tasks not only improve students' scientific worldview but also help in the integrative connection of subjects. This will further increase their interest in their professional activities and knowledge potential.

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