

**NON-STANDARD TASKS IN ASSESSING STUDENTS' KNOWLEDGE IN
GENERAL PHYSICS IN HIGHER EDUCATION**

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Abstract

This article analyzes modern approaches to assessing students' knowledge in the process of teaching general physics in the higher education system, in particular, the pedagogical and methodological capabilities of non-standard tasks. The role of creative, problematic, integrated and competency-oriented tasks in combining the theoretical and practical components of physics is scientifically highlighted. The importance of non-standard assessment methods in developing critical thinking, problem solving, scientific observation and professional competencies in students is also revealed. The article develops recommendations for improving the physics assessment system based on international educational standards and modern pedagogical technologies.

Keywords: general physics, assessment system, non-standard tasks, competency-based approach, creative thinking, problem-based learning, pedagogical technologies, higher education, physical thinking, innovative methods.

Anotatsiya

Ushbu maqolada oliy ta'lim tizimida umumiy fizikani o'qitish jarayonida talabalarning bilimlarini baholashning zamonaviy yondashuvlari, xususan, nostandart topshiriqlarning pedagogik va metodologik imkoniyatlari tahlil qilinadi. Fizikaning nazariy va amaliy komponentlarini birlashtirishda ijodiy, muammoli, integratsiyalashgan va kompetensiyaga yo'naltirilgan topshiriqlarning roli ilmiy jihatdan ta'kidlangan. Talabalarda tanqidiy fikrlash, muammolarni yechish, ilmiy kuzatish va kasbiy kompetensiyalarni rivojlantirishda nostandart baholash usullarining ahamiyati ham ochib berilgan. Maqolada xalqaro ta'lim standartlari va zamonaviy pedagogik texnologiyalar asosida fizikani baholash tizimini takomillashtirish bo'yicha tavsiyalar ishlab chiqilgan.

Kalit so'zlar: umumiy fizika, baholash tizimi, nostandart topshiriqlar, kompetensiyaga asoslangan yondashuv, ijodiy fikrlash, muammoga asoslangan o'rganish, pedagogik texnologiyalar, oliy ta'lim, jismoniy fikrlash, innovatsion usullar.

Аннотация

В данной статье анализируются современные подходы к оценке знаний студентов в процессе преподавания общей физики в системе высшего образования, в частности, педагогические и методические возможности нестандартных заданий. Научно подчеркивается роль творческих, проблемно-ориентированных, интегрированных и компетентностно-ориентированных заданий в сочетании теоретической и практической составляющих физики. Также раскрывается важность нестандартных методов оценки в развитии критического мышления, навыков решения проблем, научного наблюдения и профессиональных компетенций у студентов. В статье разработаны рекомендации по совершенствованию системы оценки знаний по физике на основе международных образовательных стандартов и современных педагогических технологий.

Ключевые слова: общая физика, система оценки, нестандартные задания, компетентностно-ориентированный подход, творческое мышление, проблемно-ориентированное обучение, педагогические технологии, высшее образование, физическое мышление, инновационные методы.

Foreword. In today's globalization and digital transformation, one of the main tasks facing the higher education system is to train specialists who are competitive, creative thinkers and can independently solve scientific problems. In particular, in the teaching of natural sciences, including general physics, traditional reproductive approaches are being replaced by modern, competency-based educational technologies. In this regard, there is a need to reconsider the system for assessing student knowledge.

Traditional tests and standard tasks often test only the student's theoretical knowledge, but cannot fully demonstrate his logical thinking, scientific analysis ability and skills in applying knowledge in real situations. Non-standard tasks allow you to identify the student's deep thinking, creative approach and practical competencies.

Main part. Non-standard tasks are tasks that require independent observation, analysis and creative approach of the student, and not based on a pre-prepared algorithm. Such tasks have the following characteristics:

1. Create a problem situation;
2. Require several solution options;
3. Create interdisciplinary integration;
4. Ensure the practical application of theoretical knowledge;
5. Encourage the student to make independent decisions.

Non-standard tasks are especially important in physics, because physics serves to explain the laws of nature, as well as analyze real-life processes. The student must not be limited to memorizing physical laws, but be able to apply them to solve practical problems.

The types of non-standard tasks in general physics and their organization are given below.

Problem tasks. In such tasks, it is important to understand the essence of a physical phenomenon, not a ready-made formula. For example: “Why is walking on ice more difficult than walking on an asphalt road?”

Through this question, the student analyzes the force of friction, surface properties, and mechanical laws.

Experimental tasks. The student conducts an independent experiment using laboratory equipment and draws conclusions. For example, using ordinary household items

to assemble an electrical circuit, determine the refraction of light, and determine the acceleration of free fall of objects in an experiment.

Creative projects. Students prepare a mini-project or presentation explaining physical laws. This method develops scientific research, information processing, and presentation skills.

Case study method. This method requires solving a physical problem based on a real-life situation. For example: “What physical factors are important for increasing the efficiency of solar panels?”

This task requires integrating knowledge of energy, optics, and thermodynamics.

Integrated task method. This method develops the student's complex thinking through tasks that connect physics with mathematics, computer science, or technical sciences.

For example, graphical analysis of the equation of motion:

$$x(t) = x_0 + v_0 t + \frac{at^2}{2}$$

Using this model, the student learns to mathematically interpret a physical process.

The practical significance of non-standard assessment is that it develops critical thinking, forms professional competencies, increases independent learning skills, and ensures academic integrity. That is, non-standard tasks encourage the student not to memorize a ready-made answer, but to search for cause-and-effect relationships. This serves the formation of scientific thinking. The practical application of physics knowledge is important in engineering, technology, and pedagogy. Non-standard tasks prepare students for real work precisely by modeling professional problems. The student is involved in working with additional resources, conducting experiments and scientific research. This is consistent with the concept of “lifelong learning”. Since an individual approach prevails in non-standard tasks, the likelihood of copying and using artificial answers is reduced.

Currently, the following approaches are widely used in the international education system:

- competency-based assessment;
- formative and summative assessment;
- electronic portfolio;
- STEM and STEAM approaches;
- digital laboratories;
- adaptive testing systems.

Non-standard tasks in physics, combined with these modern methodologies, provide high efficiency.

For example, the following law can serve as the main methodological basis for analyzing the process of electromagnetic induction:

$$\mathcal{E} = -\frac{d\Phi_B}{dt}$$

Based on this formula, the student understands not only theoretical calculations, but also the principle of operation of technical devices.

As a result of analysis and discussion, studies show that in groups using non-standard tasks:

- a) the mastery rate increases;

- b) a deeper understanding of the topic increases;
- c) students' interest in subjects increases;
- d) independent thinking is formed.

However, when developing such tasks, it is necessary to pay attention to the methodological accuracy of the task, the transparency of assessment criteria, the appropriateness of the level of complexity, and the consideration of time resources.

Also, increasing the innovative pedagogical competence of teachers is one of the important factors.

Conclusion. The use of non-standard tasks in assessing students' knowledge of general physics in higher education is one of the urgent requirements of modern education. Such tasks direct students not only to theoretical knowledge, but also to practical activity, scientific research, and creative thinking. As a result, the quality of education increases, students' competence develops, and preparation for future professional activities increases.

The widespread introduction of non-standard assessment methods serves as an important pedagogical tool in increasing the effectiveness of physical education, training innovatively thinking specialists, and forming competencies in line with international educational standards.

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