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DEVELOPMENT OF CREATIVE THINKING BASED ON PHYSICS TEST TASKS

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Abstract

The article also analyzes the issues of forming the student's creative activity by solving non-standard educational test tasks in physics. As a result, it was stated that the effectiveness of the described method of forming the ability to solve non-standard test tasks of molecular physics and thermodynamics in academic lyceum students was confirmed in the pedagogical experiment conducted in academic lyceums.

Keywords: *creative, academic lyceum, molecular physics, thermodynamics, internal energy, test, non-standard, ability, experiment*

Introduction

The main goal of solving non-standard test tasks is for students to gain a deeper understanding of physical laws, to learn to analyze physical phenomena and processes, and to learn to apply them to practical problems (B. L. Farberman, 2000; S. Bloom, 1971).

When solving non-standard physics test tasks, students follow the following methodological instructions:

1. The condition of the test tasks is read several times and it is determined which department of physics it belongs to.

2. It is understood to which section the test assignments belong, the content is understood, and the quantities given in the test conditions are expressed in «XBS» and the quantity to be found is written.

3. A drawing corresponding to the condition of the test tasks is drawn.

4. It is determined what physical laws are in the condition of the test assignments.

5. In order to solve the test tasks in a general way, based on the sequence, formulas are created that connect the unknown quantity in the condition of the problem with the known quantities.

6. Each law, rule, formula and physical quantity used in solving the test tasks is briefly explained. The quantities given in the conditions of the test tasks are put into the defined formula and calculated.

7. When answering test questions, importance is attached to its accuracy and the necessary conclusions are drawn.

Literature analysis and methodology

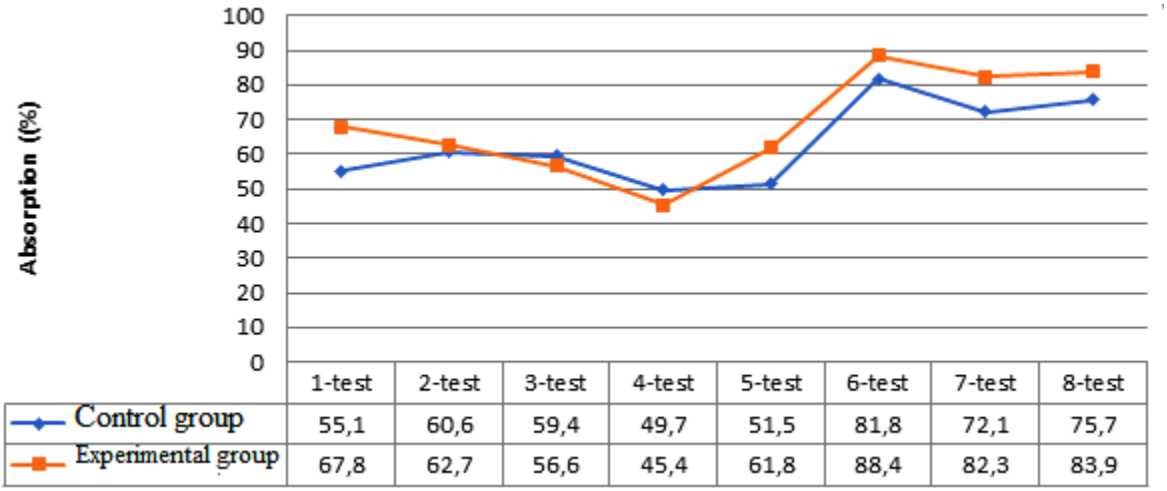
In recent years, the method of testing knowledge has become a popular method. Test tasks are structured in such a way that each of them usually tests knowledge on a topic or section of the program. Answering a relatively large number of such questions consists in the fact that several answers are offered to each of them, from which the student must choose one correct answer (S. E. Kamenetsky, V. P. Orekhov, 1976). The large number of questions included in the task allows determining the learning material at different levels, from simple learning of some elements of knowledge to its application in a familiar and learned state (V. G. Razumovsky et al., 1990). Test tasks from molecular physics and thermodynamics, structure of solids and liquids are designed to assess students' knowledge, skills and abilities, taking into account their age characteristics. Also, in addition to the curriculum and textbooks, additional information that requires creative thinking was used, corresponding to the psychophysiological characteristics of students (Sh. S. Choodu, 2018).

The test process includes the following evaluation objectives for determining whether students have acquired cognitive skills: 1) cognitive skills of knowledge and understanding, in which students know concepts, terms, physical quantities and their units, laws, and connection formulas related to physical phenomena; 2) cognitive skills of application, in which students can write the relationship of physical quantities in the form of mathematical expressions, draw conclusions and solve practical and problem tests; 3) analytical cognitive skills, where students can solve and evaluate tests that require extended and creative thinking about molecular physics and thermodynamics. The students in the control group were taught in the traditional way.

Results and discussion

11 students were selected in the control group and 11 in the experimental group. The experiment lasted 3 months during the testing process, and a total of 8 test tasks were obtained. The last of these is the final (summary) test task. There are a total of 30 test tasks in each subject. Tests from 1 to 10 require logical thinking of natural phenomena, events and processes in the economy and everyday life. Tests from 11 to 20 require the ability to memorize formulas and use them in graphs. 21 Tests in the range of –30 require students to reveal the laws in formulas and perform mathematical calculations on the topic of physics.

Figure 1. *Control test task numbers*



	1-test	2-test	3-test	4-test	5-test	6-test	7-test	8-test
Control group	55,1	60,6	59,4	49,7	51,5	81,8	72,1	75,7
Experimental group	67,8	62,7	56,6	45,4	61,8	88,4	82,3	83,9

Test 1. Ideal gas equation of state
Test 2. Internal energy of a gas
Test 3. 1st law of thermodynamics
Test 4. Amount of heat
Test 5. Saturated and unsaturated steam, air humidity
Test 6. Surface tension, surface energy and the phenomenon of capillarity

Test 7. Solid deformation

Test 8. Final test

Graph 1 shows the dependence of the numbers of the students in the control and experimental groups on the average mastery percentages when solving the control test tasks.

Control group 58.8% of theoretical test tasks 1–10, experimental group and 64.6%. Control group 11–20 formula about 64.8% of tests, experimental group and 73.1%. Control count group 21–30 about 61.2% of tests, experimental group and 65.3% of it apparently as the student's formula and his to be used about tests appropriation percentages higher than that means in practical training issues open qualifications and skills are formed.

Conclusion

We believe that the non-standard test tasks composed of molecular physics and thermodynamics are useful for the students to be able to make logical conclusions about the physical processes in nature that occur in their daily lives, to prepare for higher education institutions, and to prepare for the Olympiads.

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