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**TO DEVELOP STUDENTS' SKILLS IN SOLVING LOGICAL  
PROBLEMS IN PHYSICS**

*This article notes that the development of the logical doctrine in Central Asia had a direct impact on the formation of the worldview of Farabi, Ibn Sina, Ibn Rushd, Beruni and other progressive thinkers. The importance of using them in physics lessons, given the fact that in recent years there has been little use of logic in shaping the scientific and intellectual worldview of students, quick thinking and mental abilities in education.*

*Key words: logic, logic, reasoning, tabular method, graphical method, logical problems.*

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**РАЗВИВАТЬ У СТУДЕНТОВ НАВЫКИ РЕШЕНИЯ ЛОГИЧЕСКИХ  
ЗАДАЧ ПО ФИЗИКЕ.**

*В этой статье отмечается, что развитие логической доктрины в Центральной Азии оказало непосредственное влияние на формирование мировоззрения Фараби, Ибн Сины, Ибн Руида, Беруни и других прогрессивных*

*мыслителей. Показана важность использования логики на уроках физики, учитывая тот факт, что в последние годы логика недостаточно использовалась в образовании при формировании научного и интеллектуального мировоззрения студентов, быстрого мышления и умственных способностей студентов.*

**Ключевые слова:** логика, рассуждение, табличный метод, графический метод, логические проблемы.

In academic lyceums, the role of physics in the formation of students' scientific outlook, understanding the essence of physical phenomena and laws through deep observation, increasing student activity and interest in science, and solving problems in computational work is of particular importance. It is known that in recent years, four methods (quantitative, qualitative, experimental and graphical) are used to solve problems in physics. Each of these methods is selected in such a way as to allow students to better understand the content of theoretical material, to memorize and apply physical formulas in the problem-solving process, to engage students in science by solving interesting problems in the classroom, to confirm theoretical data through experiments, used in the training process.

However, there is also a type of issues that are rarely used in the educational process in recent years. However, these issues teach students to think fast, to relate the laws of physics to each other, to consider interactions, to harden the mind, to make the right decisions in difficult situations. These are logical issues.

In the process of teaching physics, the academic lyceum system teaches students the laws of right thinking in the formation and consolidation of new knowledge about physical phenomena, laws and laws, concepts and quantities, and through them to gain in-depth study and analysis of natural phenomena. The use of logical problems in teaching to do is the main goal.

Logical problems in physics teach students natural phenomena; reveals the content of knowledge of mechanics, electromagnetism, optics, quantum physics,

correct (true) thinking in the study of physical concepts through the methods of induction and deduction, knowledge of truth, including observation and discussion of the laws that show the relationship between ideas.

A brief analysis of the scientific works of other scholars on the subject. V.V.Sergeev in his research work "Development of logical thinking in solving problems in physics", G.G.Ruzavin "Scientific theory: logical methodological analysis" expressed his views on the development of logical thinking.

The first ideas about logic originated in the countries of the ancient East, especially India and China. In ancient Greek philosophy, the problems of logic were first considered to some extent in Parmenides' On Nature, in the aporia of Zeno of Eleusis, and in the teachings of Heraclitus. Aristotle describes logic as a science that "identifies unknown knowledge from known knowledge" and "separates true thought from false thought"<sup>2</sup>.

In Aristotle's doctrine of logic, reasoning takes the lead. The development of logical teachings in Central Asia had a direct impact on the formation of the worldview of Farabi, Ibn Sina, Ibn Rushd, Beruni and other progressive thinkers.

Tasks related to logic, like mathematics, are called "mental gymnastics". However, unlike mathematics, logical tasks in physics are fun gymnastics, which allows you to try and practice thought processes from an sometimes unexpected side. To solve them requires a quick mind, sometimes intuition, but does not require special ready knowledge, but the practice of thinking based on the acquired knowledge and experience. Even in the most complex logic problems, there are no numbers, vectors, functions. But here a method of mathematical and physical thinking is needed: the key is to understand and comprehend the logical task. The most obvious solution that always lies on the surface is not right. But in most cases, despite the confusing situation, solving a logic problem is a much simpler matter than it seems at first glance. The process

of solving problems on logic is a separate science of mathematical logic and is called "formulaless mathematics".

Logic as a science was created by Aristotle as a philosopher, not a mathematician. And logic first emerged as part of philosophy, as one of the ways of thinking. In Analysis, Aristotle created 20 schemes of reasoning, which he called syllogisms. One of his most famous syllogisms is: "Socrates is a man; all people are deadly; in which case Socrates is doomed to death. Logic (from another Greek. Logic - speech, reflection, thought) is the science of right thinking, or in other words, the "art of thinking."

The block diagram method is a method that can be applied in programming and in solving logical problems. First, the operations (commands) are separated in the form of a sequence of block diagrams, and then the order of execution of these commands is determined. This is a program in the form of a block diagram, the implementation of which leads to the solution of the task. It is widely used in physics to solve problems related to the "laws of alternating current", to draw equivalent schemes<sup>1</sup> to find common resistances.

Each of these methods is used to solve logical problems in different areas. In the process of the academic lyceum system, it is effective to use logical problems to attract students' attention, develop logical thinking and intellectual abilities, and strengthen memory in the conduct of physics lessons.

Solving logical problems from physics involves a detailed analysis of the state of the problem, distinguishing between regularities, concepts and quantities, interactions between characters or objects, general and specific features, and contradictory relationships. Logical tasks for students, as a rule, all the events related to the life of famous physicists: for example, Archimedes, Newton, or Einstein's ingenuity, that is, the ability to perceive processes that we cannot even imagine or even imagine, the process of calculating how much gold was spent on making the king's crown, which Archimedes called "Eureka." It is accustomed to the discovery of the "law of universal gravitation", which means

that in solving a logical problem it is necessary to feel the situation, see it visually and keep in touch.

The object of research. There was a need in academic lyceums to analyze the content of lectures on physics, practical laboratory classes, the content of textbooks and manuals on physics, to find interesting and easier ways for students to study physics, to explain natural phenomena as a whole.

Methods used in the study. The use of the following methods is effective in developing students' logical thinking skills:

- knowledge is formed using the methods of intuition, induction and deduction;
- through the processes of analysis and synthesis, the condition of the problem is revealed, its short description, the analysis of the answer is carried out and a single conclusion is reached;
- In the process of finding solutions to problems, the basic rules of the method of "mental attack" are followed, the skills of debate are formed;
- A comparative analysis of the educational process, the in-class and out-of-class activities of teachers and students, the attitude to the study of physics;
- Attention is paid to the problems of logical thinking in the curriculum of physics teachers.

The specific strategy for solving a logical problem can be summarized in the following five steps:

1. Focus and understand the essence of the issue.
2. Describe the interrelationships and connections between the physical laws that constitute the essence of the problem.
3. Solution planning.
4. Execute the plan.
5. Interpret and evaluate the solution.

The knowledge and thinking processes used at each stage will depend on the discipline of the students. Given the peculiarities of physics, we choose to

define and interpret the five stages of the overall strategy for solving logical problems as follows:

1. Focus and understand the essence of the issue.

At this stage, you need to develop a logical description of the problem, first visualize the events described in the problem using a sketch, write a simple statement of what you want to know, remember the physical ideas that may be useful in the problem, and describe the approach you use.

2. Describe the interrelationships and connections between the physical laws that constitute the essence of the problem.

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