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# Basic Methods for Logic Examples Solution

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**Abstract:** The fact is that solving physics problems is rather difficult for modern Kazakhstan's students. Solving logic problems develops particular qualities that reveal opportunities for the development of students' creative abilities during the learning process. The development of students' creative abilities is an important part of the development of their thinking. All problems can be solved by means of logic. Logic is a set of sciences about the laws and forms of thinking of mathematical-logical laws of calculation and the most general laws of thinking. The logical apparatus allows you to build the right judgment or conclusion and to emphasize a certain concept with its essential features. This paper shows how to apply the basic techniques of solving logic problems while teaching high school students.

**Key words:** Physics problems solving · Problems composition techniques · Solving techniques · The development of thinking · The development of students' logic

## INTRODUCTION

Physics is a fundamental basis for the theoretical training of students. Practical application of theoretical knowledge is very important at all stages of education. One of those stages during the study of the physics course is to solve problems. It is especially important for improving the various forms of students' independent work [1].

Finding a solution to the problems is one of the important means to reinforce, repeat and test students' knowledge. Systematic problems solving contributes to the development of students' thinking, preparing them to the creative activity, brings industry, perseverance, dedication. This is a good way to control knowledge, skills and abilities.

One of the most difficult educational challenges is to teach a student how to solve physics problems. Therefore it is very important what kind of teaching methods is used by teachers. Solving of a problem is an indispensable element of the educational process in physics. The ability to solve physics problems is one of the important criteria of learning. But this is one of the most hard-to-gain ability [2].

The content of problems solving as a means of training and education is described in terms of its importance during the learning process. Many scientists believe that the solving of problems in physics is an essential element of academic work: the process serves as a purpose and as a method of learning. It is an inherent part of the process of teaching physics because it allows you to form and enrich the physics concepts, develop students' physics thinking skills and their practical use of knowledge. Defining problems solving as a means of training and education, some authors specify it, through the various teaching categories, as part of the curriculum and the learning process in physics, as the purpose and method of training [3].

## MATERIALS AND METHODS

Considering the process of solving problems as a teaching method, it is necessary to highlight the purpose of this process in the formation of all the elements of knowledge, skills and abilities. Problems solving involves learning the basic elements of educational activities, its stages and operations as well as provides independent work skill training as a very important element in the

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formation of personality. On the other hand, problems solving as a method of learning should be inherent in all of the major functions: motivating, informative, educative, developing and controlling.

Definition of problems solving as a learning goal requires a special work of the teacher on the allocation of conditions to ensure a more effective formation of the ability to solve the problems [4].

**The Main Conditions Are:**

- Help students to understand the concept of "problem" as an object of study;
- Retention of its definition and structure;
- Retention of the structure of problem solving process by the students;
- The content of the process of problems solving and its basic operations retention;

The ways of the material presentation must meet the following requirements:

- To identify the basic concept and theme of the section clearly;
- To formulate the laws that explain the phenomena of nature and the laws which they obey;
- To set a functional dependence between the values using formulas and graphs;
- To generalize the material theoretically.

Problems in physics are quite varied according to different criteria reflecting their objectives. They can be classified according to various criteria, reflecting the most common features for many problems with different content.

There are following types of problems according to their solutions:

- Quality problems or issues problems;
- Quantitative;
- Experimental;
- Logic;
- Graphics;
- Problems with the production and technical content;
- Logical problems.

**The Main Part:** The problem solving is an indispensable element of the educational process in physics. This process of retention of physics course by a student is referred to active methods for promoting the retention of knowledge and the development of students' thinking [5].

Solving of the problem is an element of the educational process, which is carried out in certain forms of organization. The course of theory and methods of teaching physics considers solving problems during practical exercises only.

Qualitative problems are being solved by using a logical way. The main purpose of logical problems is a formation of concepts in physics. So we can divide logic problems according to their role in the formation of students' concepts into the following types : problems require an explanation of the phenomenon, prediction, allocation of common features and significant differences of specific phenomena, the comparison of objects and phenomena in a quantitative terms, the definition of the scope of observation and use of the phenomenon, organization and classification of the concepts, explanation of the nature of use of techniques and work methods on practice.

One of the physics thinking peculiarities is determined by the close relation between physics and experiment and the need to reconcile the theoretical constructs with an experience. In addition, physics thinking is closely associated with high levels of analysis and generalization.

Creative activity involves extensive knowledge, highly developed thinking, mental flexibility and the ability to anticipate the result of the research [6].

It is necessary to put students in such situations where they are forced to make assumptions, speculate, to exercise and develop their intuition. It is the best way for the development of creative skills.

There is a considerable experience in the exercise of students in creative problem solving as well as in the performance of creative laboratory works. First of all the task of these laboratory works is to stimulate the students to search for the principle of solutions of theoretical or experimental problem.

Creative activity of the students can be organized not only at the stage of the application of knowledge, but also during the study of a new material and while doing a homework.

Physics as a subject has features that reveal opportunities for the development of creative abilities of students during the learning process [7].

It is very effective to use demonstrations as well as teacher's lecture while initiating the students with a new material. In the transition to the study of abstract physical

models it is appropriate to use the problem method of presentation using charts, educational models, animations. Finally, the experimental verification of the theoretical results is best to organize in the form of laboratory work and experiments.

Creative tasks may differ in their form: either it is a question or qualitative, quantitative, or experimental problem, or laboratory work. It is extremely necessary to use homework in order to develop students' creative abilities, especially in the form of laboratory studies and observations directly related to educational activities in the classroom as well as writing essays and reports. Creative problems not only develop students' ability to apply knowledge in new conditions, but also create more favorable conditions for the formation of students' polytechnic education and dialectical-materialist worldview [8]. While solving this kind of problems students not just memorize the description of the phenomena but also explore and find their own way to explain it. They do not memorize the well known structures, based on existing knowledge, but learn to create a variety of settings. Logical problems are defined as the type of tasks allocated by their solutions. The logical way is a logical form which allows to solve the requirements of the problem. The logic as a science defines the logical structures through a form of reasoning. Arguments are coherently set, consistently justified series of thoughts on a topic. Theoretical analysis of concrete situations in logical problems allows to identify the structural elements. The condition of the problem contains a description of the specific situation, the particular phenomena and the statement of the problem identifies an expanded knowledge about the phenomenon.

Logical problems play an important role in the formation of concepts. We can even say they have a leading role. [9] This can be achieved thanks to the fact that the students' attention is not distracted by mathematical calculations while solving and is fully focused on identifying significances in the phenomena and processes to establish a bond between them. Logical problems include all the tasks that methodologically is usually called "quality problems".

Let's consider the most important types of logic problems from the point of view of their role in the concepts formation.

**There Are Following Types of Logical Problems:**

- Problems in which we have to show examples of manifestations of the studied properties of bodies and phenomena and their use.
- Problems that offer to highlight the characteristics of an object or phenomenon only of the given species or genus from the listed attributes of objects or phenomena.
- Problems where we need to specify the similarities and important differences between bodies, objects or events.
- Problems that require to explain the phenomenon, the reasons for its occurrence and thus to discover its connection with other phenomena.
- Problems where we need to predict the effect on the basis of knowledge of the laws of its course and relations with other phenomena.
- Problems where we need to specify the conditions which are necessary for a particular effect or phenomenon.
- Problems requiring explanation the essence of a scientific basis which is used to practice the methods and techniques.
- Problems where we need to organize (classify) the objects or phenomena according to certain parameters.

According to the content of the conditions and requirements, there are three types of logical problems: recognition of the physical phenomena on a particular phenomenon, the explanation of the phenomena and properties of matters, the prediction of phenomenon consequences [10-13].

Solving problems in the recognition of a physical phenomenon in the specific situation is the process of establishing a relationship between the genus and species.

**Here Are Examples of Logical Problems :**

**Problem 1:** There is a ball on the desk of the car that is uniformly moving in a straight line. How will the ball move on the table, if the car slows down?

**Problem 2:** There is a bird in a closed box standing on the weighing pan. Scales are balanced with weights. What would happen to the balance if the bird will fly and soar inside of the box?

**Problem 3:** Please explain why the passengers experience pain in their ears during åðó rapid push down?

**Problem 4:** Why high-speed trains (Fig. 1 ) should slow down when they meet each other, or the cars' glass will break ? In what direction the glass will fall, inside or

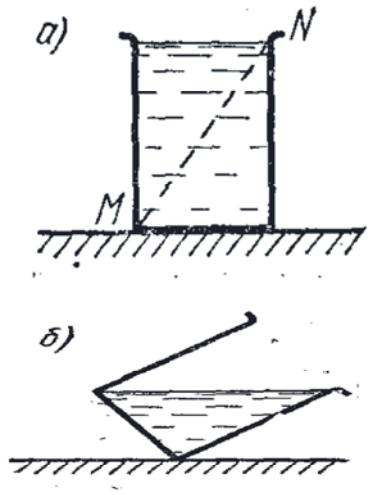


Fig. 1:

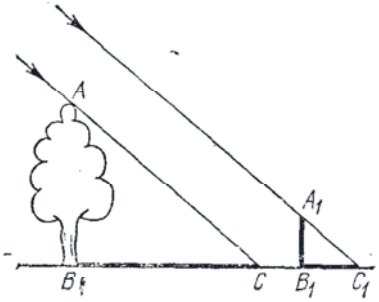


Fig. 2:

outside? Will it happen when trains are riding in the same direction? If you find yourself too close to a fast moving train will you be pushed off or attracted to it?

**Problem 5:** Did river reach help you to cross over the river? Did it help you to cross over the river in the shortest path ?

**Problem 6:** The bodies on the surface of the Earth are mutually attracted. Why do not they move towards each other?

**Problem 7:** Why is an open umbrella turns inside out in a rainy, windy weather sometimes?

**Problem 8:** How to split cylindrical glass, filled with liquid to the brim, into two equal parts, using another smaller vessel that has a different shape?

**Problem 9:** How can you measure the height of the tree with the help of a ruler on a sunny day without climbing on it?

## CONCLUSION

A new teacher's technological thinking begins with the mastery of this skill: clarity, structural properties, clarity of a methodological language and the emergence of standards-based methodology. This paper shows an example of logical problems and some methods for their solution. The model ideas about the teaching materials of educational process were specified by the results of solving logical problems. There also was designed a new generation of logic puzzles with a wide participation of the teacher. The level of complexity of and content of the problems is changing due to the fact that the teacher's activities aims to built a model of the educational process with predefined quality indicators.

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