METHODOLOGY OF TEACHING PHYSICS IN VOCATIONAL SCHOOLS

Ibragimov Rakhimjon
Doctoral student of Namangan State University
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Abstract. *In the article, the factors that help to activate students' independent work in the teaching of physics in vocational schools have been summarized, including observation, experiment, modeling, hypothesis promotion, synthesis, formalization, modeling.*

Keywords: *physics, observation, experiment, modeling, hypothesis promotion, synthesis, formalization, generalization.*

A system of knowledge that is not strengthened by interdisciplinary integration links loses its consistency and structure. The most important motivating factor is the emphasis on vocational orientation in physics education, which helps to prepare for further professional activities. Let's consider the factors that help the student to activate independent work, and among such factors, the following can be distinguished:

1) intensive pedagogical action as an important motivational factor. It envisages introducing active and interactive methods, primarily game training, into the educational process from physics, based on modern-innovative and organizational-active games. Such games include the transition from one-sided knowledge about the object to comprehensive knowledge and identifying their contradictions in formalization, synthesis and modeling;

2) participation in physics science Olympiads, scientific-research or professional-practical works and other project competitions;

3) the usefulness of independent work. If the student knows that the results of the work performed in the laboratory will be used in the preparation of articles for scientific and practical conferences, in the subjects related to his profession, the attitude to completing physics assignments will be motivated and the quality of his independent work will increase. For example, submitting an independent work as an experiment or as an assignment of a theoretical description, which can be included as an element directed to the student's future graduation work;

4) student's participation in creative activities;

5) standard and non-standard structural ranking of ratings, tests, evaluations, exams collected using the motivational factors of physical knowledge control;

6) individualization of independent educational tasks performed in the auditorium and outside the auditorium, their constant updating;

7) the personality of the teacher is a motivating factor for independent work;

8) awarding students for their achievements in scientific knowledge, creative and professional activities through reading, giving scholarships, awards, incentive points and taking measures for low-achieving students (not drastic). For example, giving a high grade for the work completed before the deadline, lowering the grade for late ones;

9) individualization of independent educational tasks performed in the auditorium and outside the auditorium, their constant updating;

10) the motivation of learning activities independent of physics can be formed using the cycle form of teaching physics.

The main strategic way of organizing students' independent work in vocational schools is not to optimize its specific types, but to create pedagogical conditions for students' activity, independence and responsibility in the implementation of all types of educational activities in the auditorium and beyond.

Scientific and educational methods of knowledge - epistemological (connected from unity to generality, from generality to limited generality), methodological (directed from the empirical basis to the theoretical core, and from the core to the deductive result) and didactic (observation, experiment, modeling, hypothesis promotion, synthesis, formalization, modeling, generalization) associated with methods. As a result of the analysis of fundamental physical theories on the basis of scientific-philosophical, psychological ideas, from the point of view of the epistemological (science of knowledge) knowledge chain, the system consists of elements in the form of unity-generality-boundary generality, empirical basis, theoretical conceptual core, and finally the result (Fig. 1).

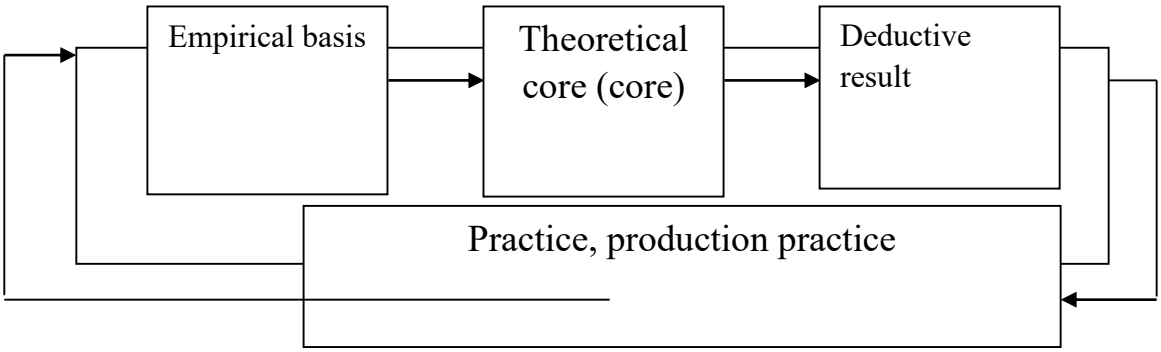

Figure 1. Organizational and content of teaching physics structure

Physical theories as generalized forms of real existence are isolated and relatively closed and closed conceptual systems. He can generalize empirical knowledge on the basis of thinking, from the possibilities of indirect emotional observation, the search for objective and subjective existing physical laws sets the task of defining and defining more essences than empirical knowledge.

We analyze physics teaching based on scientific and educational methods:

1. Empirical basis - this is based on empirical scientific evidence and is carried out through the method of inductive generalization of experimental data. The laws of physics based on experiments include Yu. Mayer's law, Dulong's and Pty's law, and Joule's generalizations and other empirical laws. Gases that obey the gas laws are called ideal gases. If the thermodynamic system being measured is thermostated for a sufficiently long time, it reaches a state of thermodynamic equilibrium. Logically speaking, empirical laws are empirical hypotheses because they derive from generalizations of the ultimate value of experiments.

2. Theoretical core - the core of physical theories consists of the basic laws of physics. The fundamental laws of physical theory describe connections of relations that are not empirically observed in real physical processes, in which only theoretical objects are studied. The core of the theory develops within the framework of the application of predictive and explanatory-illustrative functions.

3. Deductive result - the theoretical core is formed using the deductive method of scientific knowledge. An example of the deductive result of the theoretical core of general and specialized

sciences known as "Heat engineering", "Thermodynamics" and "Heat exchange processes". In the study of internal combustion engines, the fuel composition, properties, air volume, specific combustion heat and other physical parameters of the working body are determined.

The system of scientific knowledge and the system of scientific and educational methods of knowledge form a dialectical common unity, that is, practical competence in physics is developed in vocational schools, the results of knowledge are used as a means of knowledge, that is, theory becomes a method. A set of empirical, theoretical and general knowledge methods is used in the study of physical systems. General logical methods include analysis and synthesis, generalization methods, abstraction, deduction and induction methods. Empirical methods include observational methods, experimental-testing methods, for example, calorimetric method, measurements, that is, methods that ensure the transfer of physical experimental and observational data to their quantitative description. Theoretical methods include: hypothetical, that is, hypothetical deductive method, a system of basic physical theoretical laws and methods that form deductive results arising from these laws; method of mathematical formalization of properties, relationships and connections in a physical system; a method of theoretical modeling of properties and relationships in a physical system; the method of imaginary experiment, that is, methods such as carrying out actions with vital theoretical objects and processes under one or another external conditions, are relevant. The use of various empirical and theoretical methods during the presentation of the educational material allows the formation of meaningful systematic knowledge about the studied physical system.

In general, based on the above points, the methods of learning through reading are the main goal of achieving an empirical basis, a theoretical core, and a dialectical result. If the implementation of actions such as conducting experiments, observation, and synthesis, formalization and modeling in practical training form an empirical basis, the transition from it to the theoretical core involves the application of the laws of physics. Achieving a dialectical result implies the development of practical competence in physics through interdisciplinary integrated teaching in vocational schools.

If we pay attention to the generalized structure, physical connections have not yet been revealed in it, and these connections are based on the following: the methodology of educational scientific knowledge corresponds to the epistemological chain of knowledge - from singularity to generality, and from it to the most general, that is, borderline generality. Physics as a fundamental physical theory has an empirical basis, a theoretical core and deductive results. The laws of physics, together with the theoretical models of bodies, form the theoretical core of physics and the components of the base of the postulates of this theory.

The importance of using interactive educational methods in teaching physics is great. These methods provide an opportunity to search by topic, text, section. Develops concepts such as systematic thinking, structuring, and analysis. First, the students get acquainted with the requirements and rules of the method, and then they formalize the table of the method in small groups.

"Everyone teaches everyone" method is a teaching method that allows students to become teachers, to share with their peers after mastering certain knowledge. The purpose of this method is to provide students with the maximum amount of information necessary in the process of teaching, and at the same time to arouse the interest of the student in receiving and giving

information. Also, the student, who has received the amount of information, will convey it to as many friends as possible during a certain period of time.

Application. To make students interested in receiving and giving information. To listen carefully and remember the topic.

Advantage. A brief statement of his opinion. To develop the level of listening and remembering. Increase interest in science or subject.

OPINION, REASON, EXAMPLE, GENERALIZATION (OREG) TECHNOLOGY

This technology is used to solve controversial issues and conduct the educational process with discussion, because this technology teaches students to defend their opinion, to think freely and to share their opinion with others, to discuss openly, and at the same time, the culture of discussion. It helps students to clearly and concisely express their opinions on a piece of paper that is distributed, supporting or countering them.

Expected results:

1. They strengthen knowledge and skills of theoretical knowledge of physics and necessary formulas;

2. They will acquire skills on the meaning of physical quantities and units of measurement on the subject;

3. The level of preparation for professional activity increases.

Currently, the cycle method is widely used among the methods of organizing laboratory work in physics. Along with the advantages of this method, it also has some disadvantages. This is due to the fact that it leads to a violation of the algorithmic sequence of performing laboratory work and consistency in the presentation of the topic. If a clear plan is made to conduct laboratory work in accordance with the topics of lecture classes, if the cyclical performance of work is stopped, and if simulation and virtual laboratory work are introduced, it is better than conducting laboratory work traditionally.

There are a large number of challenging and professionally oriented problem sets available in Physics. Of these, the collection of physics problems compiled by A.G. Chertov and A.A.Vorobev can be said to be very popular. This set of physics problems provides answers and sufficient guidance on their solutions, in addition to standard problems. Also, each section contains examples of how to solve problems. The use of modern software tools is mentioned in the educational manual "Problems from physics and examples of using software tools in solving them" developed by A.T.Khudayberdiev, N.A.Jumaev, S.J.Turaev. Forming the ability to apply knowledge from physics in professional activity is a very important methodical task and is one of the factors of forming systematic knowledge of physical theories. As Enrico Fermi said, one knows physics only if one knows how to solve problems. Therefore, we can list a large number of methodological literature devoted to the solution of problems from physics, which are oriented towards various professional activities.

How to ensure that the theoretical knowledge that the student received at the vocational school is not available in its own right, but is maximally used in the professional activity of the engineer? The amount of information on this is so large that it cannot be mastered in a relatively short period of physics education if it is not organized on a new basis in principle. A wide and systematic application of general methodological principles, generalized methods, the most general physical concepts, etc. in the process of physics education can serve as a basis for this. The authors tried to implement such approaches in solving physics problems. The theoretical

foundations of the general approach to solving problems from physics, methods of solving standard, non-standard, professional problems are considered.

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