TEACHING A COURSE IN THEORETICAL PHYSICS ACCORDING TO THE PRINCIPLE OF CONTINUITY

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ABSTRACT

The article discusses the issues of improving the teaching of theoretical physics based on the implementation of the principle of continuity. It is shown that in the physical worldview, along with the dynamic ones, it is necessary to focus on statistical laws. It is noted that teaching theoretical physics using consistency allows students to develop the skills of applying the principles of correspondence and didactics. The author proposed the optimal sequence in the study of probabilistic-statistical ideas and concepts at different stages of training. In conclusion, a definition of continuity is given as a principle that demonstrates the correct distribution of educational material among the stages of training, certain relationships between them and their consistent development.

Keywords: Continuity principle, didactics, correspondence principle, continuing education system.

INTRODUCTION

Raising a highly educated, highly cultured and healthy generations is one of the urgent tasks of modern higher education. It should be noted that when teaching the basics of physics, the attention of the teacher should be on the solution of such common human problems as the science of the integrity and completeness of the picture of the world, active participation in the life of man and society, health protection, food safety and environmental protection.

There is a need for teachers who are highly educated and are fluent in modern teaching technologies and interactive methods, who are able to use them in the organization of the educational process and their activities, in order to increase the effectiveness of training and self-education of young people, to connect knowledge and skills in physics to life. Teaching future physics teachers in theoretical physics has the goal of deeply acquainting them with the foundations of theoretical physics, the emergence and stage development, as well as the struggle of ideas in these processes and their implementation into practice. Important tasks of the continuous educational process are the upbringing of the perfect generation, improving the quality of teaching, organizing the educational process, eliminating shortcomings in the process of their implementation, strengthening links between different stages of teaching theoretical physics courses, and comprehensively improving the training of teaching staff.

In the process of teaching physics, future physics teachers need to consciously master basic physical concepts and laws, as well as theories in the form of stable and lasting knowledge. This requires the effective use of educational content and method, widespread use of advanced pedagogical technologies and the integration of physical knowledge with life. Consequently, radical reforms in education require an in-depth study of physics.

Today, the main strategic directions of the modernization of the education system are the introduction of innovative, pedagogical and information and communication technologies in the educational process, based on the requirements for the formation of a self-developing personality in higher education.

In pedagogical higher educational institutions, students complete the course of general physics, and then proceed to study the course of theoretical physics in the following sequence: classical mechanics, electrodynamics, quantum mechanics, statistical physics and thermodynamics. The training of highly qualified physics teachers requires a deep understanding of the theoretical foundations of the physics course in secondary schools, academic lyceums and vocational colleges throughout the entire period of study, as well as the implementation of the continuity of teaching physics at different stages of education. However, pedagogical universities do not always successfully solve this problem. Many students find it difficult to apply their knowledge of physics to teaching physics in their teaching activities in the education system.

Materials and methods

They do not have a clear idea of the degree of complexity required for the taught theories and practical exercises at various stages of training; it should be noted that in their physical worldview, dynamic laws play the main role, leaving no room for probabilistic and statistical laws. In order for students and pupils to clearly imagine these patterns, it is necessary to show their manifestation using specific examples. For dynamic laws, we will use Newton's second law $\vec{a} = F \vec{} / m$ or $F \vec{} = ma \vec{}$. In this formula, the acting force is $(F) \vec{}$ is the cause, acceleration $a \vec{}$ is the effect. If we depict their relationship in the form of a table, then we get

$\vec{F}$	$\vec{a}$
$\vec{F}_1$	a_1
$\overrightarrow{F_2}$	$\vec{a}_2$
$\vec{F}_3$	$\vec{a}_3$
……..	……
……	……
$\vec{F}_n$	$\vec{a}_n$

From this it is clear that each value of the force corresponds to a certain value of acceleration. From a mathematical point of view, there is an unambiguous connection between them. Therefore, when we are talking about a dynamic law, it means an unambiguous relationship between physical quantities. The same cannot be said about the statistical pattern. An example is tossing a coin or dice. Consequently, with a statistical pattern, there is a multivalued relationship between the quantities. This means that there is a connection between the stages of development of knowledge, qualifications and skills, that is, knowledge obtained at an early stage of learning is preserved and used at the next level. The knowledge gained from the past and subsequent ones will be combined into one whole.

One of the reasons for such inconsistencies is that in teaching general physics, theoretical physics, and methods of teaching physics in pedagogical universities, insufficient attention is paid to one of the important principles of didactics - the principle of continuity. The principle of continuity provides for the correct distribution of educational material in teaching physics at different stages of training, the establishment of the necessary connection between them and the gradual development of these connections. The following principles can be used to apply the principle of succession:

• Continuity reflects the objective development of nature, society and thinking and describes both the development of relationships and the concepts themselves. Since didactics is a theory of teaching and learning, it is also associated with the development of these processes, which is a didactic principle.

• Since the principles of continuity and consistency are philosophical categories, they are also related to other categories, it is important for didactic research to analyze the interconnectedness of the concepts of continuity and generalization, continuity and interdependence, continuity and systematization.

Since development is quantitative and qualitative, it is important to look at the level of development of knowledge about the types of continuity and generalization in knowledge. This method can also be applied to didactic research.

RESULT AND DISCUSSION

The principle of consistency serves as a methodological principle in pedagogical and didactic research. Summarizing these points, the sequence can be described as follows: “Continuity in learning means the relationship between the stages of development of knowledge, qualifications and skills, ie. knowledge gained at an early stage of learning is preserved and are used at the next level. The knowledge gained from the past and subsequent ones will be combined into one whole. "

The consistency in teaching physics should take into account not only the development of basic concepts and theories at different stages of learning, but also feedback. The essence of this feedback lies in the fact that if students acquire the ability to apply physical concepts, laws and theories at different stages of their education, they will be more effective and of better quality in students. This will not only lead to a complete mastering of physics, but will also allow them in the future to master the physics course in higher education more deeply. In other words, in the future, the knowledge of physics students will grow in a spiral manner.

The importance of the principle of correspondence in a clear understanding of the role and place of the principle of continuity in the study of physics is undeniable. The principle of correspondence was proposed by N. Bohr in 1918 and plays an important role in the development of physics. Experience shows that teaching sections of theoretical physics using the principle of continuity not only allows them to develop in depth and deeply, but also develops students' skills and abilities to apply the principles of didactics. When using the correspondence principle, the formation of probabilistic-statistical ideas and concepts in teaching branches of theoretical physics, such as quantum mechanics, statistical physics and thermodynamics, is of great importance. In physics, clear and accurate ideas about statistical laws appeared in the middle of the 19th century, thanks to the development of the molecular kinetic theory of matter. Great representatives of scientific thought have long understood that this problem is of great importance in physics. But this was after the works of physicists Clauzius, Maxwell, Boltsmann, Gibbs, Eynshtein, Smoluchowsky and others in the field of

molecular kinetic theory. In the works of these scientists, the problem of the relationship between statistical and dynamic laws, the properties of macroscopic substances and the physical laws associated with them determines that their particles obey the theory of probability, mathematical and statistical laws. Consider teaching the section of statistical physics and thermodynamics based on the principle of continuity. The main methodological idea of this section is to ensure the organic unity of statistical and phenomenological methods in the learning process. This block should be considered not only when introducing basic concepts of statistical physics, but also when describing the entire course.

CONCLUSION

Only then will students understand the true nature of the probabilistic and statistical ideas and concepts that will be discussed in this section. This will play an important role in their future practical work as they gain knowledge of these ideas and concepts and have a clear understanding of their practical value. The following sequence is proposed in the study of probabilistic-statistical ideas and concepts at different stages of training:
1. The curriculum content of this course should be related to the general physics course and introduction to molecular physics and thermodynamics, as well as to the materials of physics courses in high schools, academic lyceums and professional colleges.
2. The material of the course in statistical physics and thermodynamics should be divided into general physical and professional knowledge.
3. It is necessary to conduct seminars on this course and define their topics.

It should be noted that dynamic laws play the main role in their physical worldview, leaving no room for probabilistic and statistical laws. One of the reasons for this shortcoming is that when teaching general physics, theoretical physics, and teaching physics in pedagogical universities, due attention is not being paid to one of the important principles of didactics, the principle of correspondence. The principle of continuity provides for the correct distribution of educational material in teaching physics at different stages of training, the necessary connection between them and the gradual development of these connections.

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