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Pedagogical-Psychological Aspects Of Teaching Elementary Particle Physics In Practical Classes In General Physics

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Abstract: In this article, the pedagogical and psychological aspects of solving problems related to the physics of elementary particles in practical classes from general physics are considered.

Keywords: student, reader, teacher, pedagogy, psychology, psyche, age characteristic, practical training, elementary particle, fundamental interactions.

Our research shows that over the last 20-25 years, the structure of curricula, programs and teaching standards has changed significantly compared to the development of teaching technology. During this period, modern science, technology and technology went through a period of strong development.

Currently, new pedagogic, innovative, interactive technologies are widely used in physics lessons and training, and modern technical means of teaching are constantly being improved.

As a student of a higher educational institution of pedagogy is considered to be a promoter of science and a deliverer to the next generation, the result required from him in the future is to increase the interest of his students in physics and to be the main reason for mastering the science, which, in turn, is the skill of the pedagogue and also depends on mental capacity.

In general, both sides, i.e. teacher and student, have a role in mastering physics by students, and it includes the teacher's activity (teaching) and

embodies student activities (learning). Therefore, the pedagogical higher education institution has a responsible task in training physics teachers.

Successfully solving the educational issues of the students of higher education institutions of pedagogy in the course of practical training from general physics to studying elementary particle physics and increasing the efficiency of learning, the process of personality formation, their age characteristics, the aspirations of the student's personality (interests, desires, attitude to study, work, team and oneself), will and emotional qualities (independence in discussion and work, initiative, demandingness, striving for a goal, ability to arouse emotions level, strength and depth of emotional concerns, emotional stability), it is necessary to know the characteristics of cognitive activity and mental development (attention, memory, thinking and speech, thinking skills).

The driving force of psychological development in a student of a higher educational institution, just like in a school student, is the dialectical opposition between the immediate past and the present. For example, there are contradictions between the demands that arise during the student's educational activity, the growing demands of younger students and the possibilities of satisfying them, and the current level of their mental development. These contradictions appear in the process of teaching and educating students for a great life, and they are gradually resolved. As a result, a higher stage of intellectual development is observed in a student of a higher educational institution compared to a school student.

As a person's (student's) psyche develops, integrity, unity, and stability increase, and as a result, their integration occurs. This situation leads to the emergence of one or another personality trait.

In the process of education and upbringing, the psyche has the ability to change in accordance with the intended goal and has the property of flexibility. If any part of the psyche does not develop well, other parts of it develop rapidly (balancing phenomenon).

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Practical classes in general physics are given in the curriculum of the subject, their purpose is to strengthen the knowledge of general physics, broaden the worldview and teach students to apply it in practice during lectures and independent work.

If we compare practical training with lecture training, it becomes clear that it is a logical continuation and complement of the material presented in the lecture. If we say that a lecture on general physics forms the basis of imparting knowledge in a generalized form, practical training strengthens, expands and clarifies this knowledge. This process, that is, practical training, is a clear concept in pedagogy and includes laboratory training, problem solving, exercises, and seminar training.

In general physics practical classes, students learn to solve problems related to the main topics. Instructions and recommendations on the organization of practical training are developed by professors and teachers of the department. In it, students enrich and strengthen the knowledge and skills they have acquired on the main lecture topics by solving practical problems. It is also recommended to strengthen students' knowledge based on textbooks and manuals, use handouts, increase students' knowledge by publishing scientific articles and theses, solve problems, prepare visual aids on topics, etc.

Solving problems in general physics is an integral part of teaching it. In this activity, not only the content of the course is deepened, but also students' thinking, mastering of cause and effect relationships, and the ability to use laws and theories in practice increase. As a result, students' independent thinking develops and their creative abilities grow. In this process, special attention should be paid to the fact that, firstly, the problem to be solved should correspond to the theoretical material to be mastered, and secondly, it should form and develop the skills and abilities of independent thinking in students.

Psychologists put forward the following description as a criterion for increasing the effectiveness of teaching General Physics on the basis of practical training in pedagogical higher education institutions:

the speed of completing tasks and mastering them or the level of acceptance;

the sharpness of thinking determined by reasoning, on the basis of which students learn new laws for themselves;

level of analytical activity of practical assignments;

methods of mastering mental activity formed in the performance of other tasks based on the performance of one task;

know how to systematize and generalize the theoretical knowledge and practical skills and abilities acquired in the performance of practical tasks.

When conducting general physics practical classes in pedagogical higher educational institutions, first of all, efforts should be made to increase the level of students' mastery of physics knowledge.

In the training of future teachers, it is necessary to take into account the unique pedagogical and psychological features of organizing practical lessons in elementary particle physics:

it requires students to understand the content of the objects being studied, delve into their essence, create different physical models, make the transition from one form of abstraction to another, and perform similar imaginative actions. For example: The processes that occur with elementary particles cannot be seen with the eyes and cannot be grasped by hand, because they are based on deep imagination and thinking;

In practical exercises in elementary particle physics, more models, different schemes, tables and laws are used than in practical exercises from other branches of general physics. For example: Processes can be analyzed using a general table of elementary particles. In particle physics, there are specific laws, i.e. universal or approximate conservation laws, unlike classical physics, and these conservation laws are more numerous than the conservation laws in classical physics, and differ in terms of characteristics, that is, some o 'interactions are preserved and destroyed in others;

use of virtual developments reflecting the processes. For example: the use of virtual developments that reflect the processes in the world of elementary particles helps the student visualize the process and provides visibility;

using exercises and problem solving. For example: in elementary particle physics practical exercises, calculations are not always performed when solving problems. The analysis of the processes is in the main place;

To learn physics well, you need to be able to solve problems. Solving problems complements physics lectures in a certain sense. By solving problems, students expand and deepen their knowledge, learn to understand the content of laws and formulas in depth, consider the limits of their application, acquire the skills of applying general laws to specific situations. In the process of solving problems, the skills of calculation, working with literature and data are formed. Problem solving teaches special ways of approaching physical phenomena. Students learn to take a serious approach to knowing the scope of events when solving a problem related to a certain topic.

By solving problems in the study of elementary particle physics, they will gain a deep and comprehensive understanding of the content of the section, such as the application of the fundamental conservation laws in nature, the quantities characterizing particles, the properties of the conservation laws in the world of particles, the connections between the conservation laws and symmetries, and develop their imagination and problems solution, they make sure to analyze them.

The peculiarity of improving the content of practical training in elementary particle physics in pedagogical higher education institutions is that, based on the available theoretical information, students reasonably understand the process that is actually observed as a result of the implementation of the laws of conservation among the processes that occur in several ways. will be able to distinguish.

For example: Specify the reasons for prohibiting the following processes

1. $\Sigma^- \rightarrow \Lambda^0 + \pi^-$
2. $\pi^- + p \rightarrow K^+ + K^-$
4. $n + p \rightarrow \Lambda^0 + \Sigma^+$
5. $\pi^- \rightarrow \mu^- + e^- + e^+$

3. $K^- + n \to \Omega^- + K^+ + K^0$ 6. $\mu^- \to e^- + \nu_e + \bar{\nu}_\mu$

Which of the following processes does not occur or is not observed in practice because the laws of conservation are not fulfilled?

1. $\Sigma^+ \to \pi^+ + n$
2. $\Sigma^- + p \to \pi^0 + \bar{K}^0$
3. $\pi^- + p \to \Lambda + \bar{K}^0$
4. $\pi^- + p \to \Sigma^+ + K^-$
5. $\pi^- + p \to \Sigma^- + K^+$
6. $\Sigma^0 \to \Lambda + \gamma$
7. $\Sigma^0 \to \Lambda + e^- + \bar{\nu}_e$
8. $\Sigma^0 \to \pi^0 + \pi^0$

As we noted above, the pedagogical and psychological features of improving the content of practical lessons in elementary particle physics are the preservation of materials related to elementary particle physics (baryon and lepton charges (numbers), strange particles and strangeness quantum numbers) in practical lessons. in order to ensure students' mastery of the properties of particles and the conservation of the quantum number of particles, the processes of fundamental interactions in the world of particles and the quantities that are stored), they should perform appropriate imaginative actions (analysis, comparison, abstraction, generalization, synthesis) making, etc.) should be taken into account in the purpose-oriented educational activities of development students

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