

FEATURES OF TEACHING PHYSICS AT SCHOOL

*Alizhanov Dilmurod Azamjon ugli**PhD, Associate Professor, Department of Intellectual Objects and Information Technologies,
Namangan State Pedagogical Institute
e-mail: dilmurod0413@gmail.com*

Abstract: The article discusses key aspects of improving teaching methods: activating students' cognitive activity, the role of a physical experiment, developing independence and motivation, rethinking the approach to solving problems as a tool for learning, deepening intra-subject connections and transforming the role of a teacher into an organizer of the educational process. The need to adapt physics teaching to modern challenges and goals of state educational policy is substantiated. The paper also presents research methods, including the analysis of regulatory documents, scientific and pedagogical literature and advanced pedagogical experience.

Key words: physics, physics teaching methods, education in Uzbekistan, education reforms, STEM, cognitive activity, motivation, physics experiment, problem solving, independent work, intra-subject connections, New Uzbekistan, Third Renaissance.

Introduction. In the context of dynamic transformations that have engulfed Uzbekistan at the present stage of its development, the education system is one of the key priorities of state policy. Strategic goals aimed at building a "New Uzbekistan" and laying the foundations of the "Third Renaissance" are inextricably linked with the formation of a highly intellectual, globally competitive generation. In this process, a special role is given to natural sciences, among which physics occupies a fundamental position, being the basis for technological progress and innovative development of the country.

The modern pedagogical space of Uzbekistan is characterized by an active search for and implementation of effective models of training, modernization of the content of education, updating of educational and methodological complexes and advanced training of teaching staff. State support is aimed at popularizing science, developing STEM education (Science, Technology, Engineering, Mathematics) and creating conditions for revealing the creative and scientific potential of students. In these conditions, teaching physics at school is particularly relevant and requires a rethinking of traditional approaches.

It is necessary to take into account that the effectiveness of physics education directly affects the training of future engineers, researchers, IT specialists - personnel who will determine the economic power and technological sovereignty of the country. Therefore, the analysis of the features of teaching physics at school, meeting the challenges of the time and the political and pedagogical guidelines of the Republic of Uzbekistan, becomes an important scientific and practical task. This article is intended to highlight the key aspects of this process, identify existing trends and suggest ways to improve the methodology of teaching physics to achieve the educational and strategic goals set by the state.

Physics is considered as the foundation of natural science education, philosophy of natural science and scientific and technological progress. Physics as a science has as its subject area the general laws of nature in all the diversity of phenomena of the world around us. The integration tendencies characteristic of modern science have led to a significant expansion of the object of study in comparison with the physics of the 19th century, including space phenomena

(astrophysics), some phenomena of the living world and properties of living objects (biophysics, molecular biology), information systems (semiconductor, laser and cryogenic technology as the basis of computers). Physics has become not only the theoretical basis of modern technology, but also its integral part, they are organically intertwined with each other. Power engineering (in particular, nuclear and thermonuclear), communications (lasers, fiber optics) - this is the creation of materials with predetermined properties, etc. - convincing examples of the interpenetration of physics and technology. This determines the educational significance of the subject "Physics" and its content and methodological lines - motion and forces, matter, field, energy, methods of scientific knowledge.

In the aspect perspective, physics considers the spatio-temporal forms of existence of matter in two forms - matter and field, fundamental laws of nature and modern physical theories, problems of the methodology of natural science knowledge. In the object perspective, physics studies various levels of organization of matter: microscopic - elementary particles, atom and atomic nucleus, molecules; macroscopic - gas, liquid, solid, plasma, space objects as a mega-level. In the object perspective, four types of interactions are also studied (gravitational, electromagnetic, strong, weak). Properties of the electromagnetic field (including optical phenomena), as well as a wide range of technical applications of physics (mechanization, automation, power engineering, semiconductor and laser technology, processing and transmission of information, etc.) and related environmental problems.

In the bad days, physics throughout the world became a part of not only natural science education, but also of the humanities, and became a paradigm of modern scientific thinking.

At school, physics should be considered as one of the subjects that performs not only a cognitive function, but also a developmental and educational one. This subject is necessary for everyone - natural scientists and humanists, since it contains a powerful humanitarian potential that is directly related to the development of thinking, the formation of a worldview, the disclosure of a holistic picture of the world through the basic laws and principles of nature. The education of an aesthetic sense, the development of spirituality.

Research methods

For a comprehensive study of the features of teaching physics at school in the current pedagogical and political situation in Uzbekistan, this article used a set of complementary research methods. The methodological basis was a systems approach that allows us to consider the process of teaching physics as an integral system influenced by external (socio-political, economic) and internal (pedagogical, methodological) factors.

The leading **theoretical methods** used were:

1. **Analysis of regulatory documents:** Study of Decrees of the President of the Republic of Uzbekistan, Resolutions of the Cabinet of Ministers, concepts of public education development, state educational standards and curricula in physics. This method allowed to identify key state guidelines and priorities in the field of physics education aimed at modernizing the system and improving its quality in accordance with the "New Uzbekistan" strategy.
2. **Study and generalization of scientific, pedagogical and methodological literature:** Analysis of domestic and foreign studies devoted to the problems of teaching physics,

innovative teaching technologies, as well as publications reflecting the experience of educational reform in Uzbekistan and other countries.

3. **Comparative and contrastive analysis:** Comparison of traditional and modern approaches to teaching physics, as well as an analysis of the compliance of existing methods with the goals and objectives set by the state educational policy, including an emphasis on the development of STEM competencies and training of personnel for the innovative economy.

4. **Analysis of teaching and methodological complexes:** Study of the content and structure of current textbooks, teaching aids and digital educational resources in physics for their compliance with modern requirements and tasks facing school education in the republic.

The **empirical** research methods included:

1. **Pedagogical observation (indirect):** Analysis of available data and reports on the state of physics teaching, results of education quality monitoring, as well as studying publications and speeches of practicing teachers reflecting the real situation in schools.

2. **Analysis of advanced teaching experience:** Study and generalization of the experience of innovative teachers and leading educational institutions of Uzbekistan, successfully implementing modern methods of teaching physics and achieving high results in the context of ongoing reforms.

3. **Content analysis:** Study of materials from pedagogical forums, online communities of physics teachers to identify current problems, requests and opinions of the teaching community regarding changes in the teaching system.

The comprehensive application of these methods made it possible to obtain objective data on the characteristics of teaching physics in schools in Uzbekistan at the present stage, to identify existing challenges and to determine promising areas for improving this process in line with state educational policy.

Solving physics problems should be carried out in optimal combination with other teaching methods. At the first stage of physics training, one can focus on the content and level of complexity of problems given in a stable textbook; preference is given to problems in one or two steps and qualitative problems. At the second stage, problems in the solution of which several patterns are used acquire greater importance; the solution of problems is carried out, as a rule, at first in a general form.

When preparing students for laboratory work, an understanding of the methods for calculating measurement errors is given. In the future, when students perform laboratory work, it is necessary to develop the ability to calculate measurement errors of physical quantities. When selecting work for a physics workshop in each class, it is necessary to ensure that the main issues of different topics of the program are covered. Homework is usually used to consolidate the material already studied, to practice the relevant skills and abilities. To prevent homework from overloading students, it must be strictly dosed, accompanied by clear explanations and instructions (what to remember, what questions to answer, how to fill out a table, etc.). Sometimes it is useful to differentiate the volume and complexity of homework, taking into account the individual characteristics of students. The time for completing homework is determined by the average standards established by the Ministry of Education of Russia for all

academic subjects. The ancient saying is well known: "You can lead a horse to water, but you can't make it drink." This truth is very applicable to the learning process. No ardent fantasy regarding the form of conducting a lesson can compensate for the main thing - the student's aspiration to master knowledge. And it needs to be awakened!

An integral quality of any lesson should be the end goal of the lesson and the way to achieve it, clear to all students in the class. Moreover, each student should know in advance how many lessons the topic being studied is designed for and what the teacher's requirements for the end result will be. At the same time, each previous lesson should be a means of ensuring the next one.

The effectiveness of the educational process depends not only on the focus and determination of schoolchildren, but also on their cognitive independence. For this, it should always be clear in class what they should do to learn. In other words, schoolchildren should always know what they are studying and master the methods of cognition, i.e., first of all, have a clear idea of the process itself. And it is as follows: we observe natural phenomena. Based on their comparison with each other and with the facts known to us, we have problems. To solve them, we build various hypotheses; we test these hypotheses experimentally - either directly or indirectly - through the consequences that follow from them; then we find ways to use the phenomena studied. The central point in the process of scientific cognition is the development of a hypothesis. It is excitingly interesting! That is why schoolchildren love problem-based learning. Further improvement of the entire teaching methodology will depend on how much we manage to expand the opportunities for students' cognitive creativity.

One of the tasks that we set for ourselves in a physics lesson is to deepen intra-subject connections. This requires some explanation.

In a school physics course, such sections as mechanics, molecular physics, electrodynamics, quantum physics are traditionally studied, the information from which is adapted to the cognitive capabilities of students. At the same time, each of the sections uses mainly "its" conceptual apparatus, and a qualitative examination of many physical phenomena limits the possibilities of their repetition. So it turns out that the deep internal connection between objects and processes of the material world that exists in nature is not obvious to students, eludes their attention.

The above postulate must be supplemented by the following statement: the interest of students at each stage of learning is connected with knowledge. Let us define knowledge in the context of this analysis as the discovery of something essentially new and previously unknown, which is significant for students in connection with their previous knowledge and ideas, everyday experience, and practice accessible and known to them. This does not mean knowledge in general, but personal, individual knowledge, i.e. the discovery of an idea, law, or method. Moreover, special emphasis in the learning task should be placed on identifying a new substantive fact that is intellectually and practically interesting in itself or colored in an attractive color by special methodological means, presented in an entertaining form, etc.

Let us formulate the requirements for setting and solving an educational physics problem that, according to this hypothesis, ensure the cognitive interest of students. The problem, from this point of view, should be novel (situational and meaningful), connected with practice (in particular, with the life horizons of students), practical value, a research element, information richness, methodologically correct setting and solution should be used in the work on the problem, the analysis of the obtained result should be algebraic (functional), physical, figurative.

The main character in the lesson is the student! Moreover, the student independently “creates” new knowledge and applies it to solve problems. The teacher is the organizer of his activity. Developing such lessons is not easy: it is necessary to know the logic of obtaining new knowledge specified in the educational goal of the lesson, adapt it to the lyceum conditions. All this takes a lot of time. One way to get around this difficulty is to plan independent cognitive activity of lyceum students not for a separate lesson, but for the entire topic.

The first step in this planning is to formulate the goals of the students' cognitive activity. To do this, it is advisable to remember that the formulation of the goal of any activity must meet the following requirement: it must indicate the type of activity, its final product and its properties.

Summarizing the above, we can suggest guidelines for building the goals of students' cognitive activity in a certain logical sequence:

* by analyzing the textbook text, we establish what the subjects of study are in a given topic: a physical phenomenon, an object, the essence of a phenomenon (object) or a group of phenomena (objects);

* we draw up schemes of activity at the empirical and theoretical levels of knowledge applicable to them;

* we decide: at what level it is appropriate to organize the cognitive activity of lyceum students; in doing so we take into account:

a) the classes available to students in a given class;

b) the duration of knowledge acquisition at each level;

c) the degree of complexity of the activity at both levels (we find out which path is easier);

d) availability of equipment in the physical office;

d) we come up with an initial situation, express the cognitive need that arises in this situation in the form of a question, and formulate the goal of cognitive activity that corresponds to this need.

The conducted analysis of the features of teaching physics in schools, based on the current educational policy in Uzbekistan, allows us to draw the following key conclusions:

In the context of the state initiatives “New Uzbekistan” and “Third Renaissance”, high-quality teaching of physics is of paramount importance. It is considered as a fundamental basis for training highly qualified personnel capable of ensuring technological progress, innovative development and economic sovereignty of the country, especially within the framework of the development of the STEM direction.

Physics in the school curriculum should go beyond the simple assimilation of facts and formulas. It is necessary to reveal it as the basis of natural scientific knowledge, the philosophy of natural science and an integral part of scientific and technological progress. Its integrative nature, connection with various fields of science and technology, as well as its humanitarian potential in the formation of a worldview, scientific thinking and a holistic picture of the world are emphasized.

Effective teaching of physics requires a combination of various forms and methods. A special role is given to physical experiments, independent work of students (including work with educational and additional literature, solving problems), as well as developing the ability to apply theoretical knowledge to explain phenomena and analyze results. Conducting generalizing seminars in senior classes helps to systematize knowledge.

It is emphasized that no methodological tricks can replace the student's internal aspiration for knowledge. The most important task of the teacher is to awaken this aspiration through setting clear goals, demonstrating the logic of scientific knowledge (observation - problem - hypothesis

- experiment - application) and creating conditions for students' cognitive creativity, in particular, through problem-based learning.

In order to develop a holistic understanding of the physical picture of the world in students, it is necessary to systematically establish and emphasize the connections between the various sections of the physics course. This can be achieved through comparing new material with previously studied material, using logical-structural schemes, solving combined problems, and consistently implementing cross-cutting physical ideas (conservation laws, principles).

The traditional approach to solving educational problems often does not arouse cognitive interest in schoolchildren. It is proposed to shift the emphasis from training to "cognition" - the discovery of something new, significant in the context of existing knowledge and experience. Problems should be novel, connected with practice, have a research element and facilitate a deep analysis of the results.

A modern physics lesson should be built around the independent cognitive activity of the student, where he acts as the "creator" of new knowledge, and the teacher is the organizer and facilitator of this process. This requires the teacher to carefully plan the cognitive activity of students at the level of the entire topic, and not just a separate lesson, with a clear formulation of the goals of this activity.

Thus, improving the teaching of physics in schools in Uzbekistan requires a comprehensive approach aimed at developing students' cognitive activity and independence, forming their scientific worldview and practical skills, which corresponds to modern educational trends and strategic development goals of the country.

References:

1. Zokhidov, I. O. (2020). Theme and interdisciplinary connections in teaching sound phenomena on the course of physics for the 6th grade. In Новые педагогические исследования (pp. 8-10).
2. Алижанов, Д. (2022). 6-синф физика фанини фанлараро уқитишнинг назарий тахлили. Общество и инновации, 3, 417-422.
3. Zakhidov, I. O., & Karimov, A. M. (2024). Development of students' ecological culture by directing innovative activities using steam technology. Science and innovation, 3(A10), 251-255.
4. Alijanov, D., & Zaxidov, I. (2022). Таълимда фанлараро боғланишларнинг функциялари. Science and innovation, 1(B7), 1406-1411.
5. Zakhidov, I., & Boyturayeva, G. (2023). Use of Natural Science and Geography materials in Physics teaching. Science and innovation, 2(B3), 483-487.
6. Umarov, A., Zakhidov, I., & Boyturayeva, G. (2024). Interdisciplinary relationships and its application in teaching the topics of electricity in a school physics course. Science and innovation, 3(B1), 166-170.
7. Захидов, И. О. (2022). Важные аспекты преподавания физики в 6 классе на основе междисциплинарных связей. In Учёный XXI Века (pp. 80-83).
8. Boyto'raeva, G. (2022). Фанлараро алоқадорлик ва унинг яримўтказгичлар физикасини ўқитишдаги ўрни. Science and innovation, 1(B4), 533-537.
9. Obidjonovich, Z. I., & A'Zamjon, A. D. (2021). 6-sinf fizika fanida tovush hodisalarini o'qitish orqali ta'lim samaradorligini oshirish yo'llari. Oriental renaissance: Innovative, educational, natural and social sciences, 1(3), 424-432.



10. Ogli, A. D. A. (2022). The methodological recommendations for teaching the subject “natural science (science)” (on the example of knowledge in physics). *ACADEMICIA: An International Multidisciplinary Research Journal*, 12(8), 24-29.
11. Alijanov, D. (2022). Физик билимларни фанлараро алоқадорлик асосида ўқитиш методикасини такомиллаштиришнинг педагогик ва статистик таҳлили. *Science and innovation*, 1(B8), 794-802.
12. Karimov, A. (2023). Ecological education and upbringing in teaching of Physics. *Science and innovation*, 2(B2), 439-442.
13. Алижанов, Д. А. Ў., & Захидов, И. О. (2022). Фанлараро алоқаларнинг тарихий ривожланиш босқичлари. *Science and innovation*, 1(B4), 22-29.
14. Boyturayeva, G. K., & Zakhidov, I. O. (2024). Ways of implementing interdisciplinary connections in teaching the topics of " electric charge" and" electric resistance" in the 7th grade. *Science and innovation*, 3(A10), 246-250.
15. Алижанов, Д. (2021). Способы развития научного мышления учащихся при обучении строения вещества в курсе физики в 6 классе. *Общество и инновации*, 2(3/S), 15-19.