

Topic: Technology to improve the methods of teaching physics in higher education on the basis of a competency approach (on the example of training technical engineers)

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ABSTRACT: This article develops the following problems and educational technologies related to education including: The unique role of physics in human life in the world, the creation of favorable conditions for the lives of all citizens living in our country in the training of technical personnel in higher education institutions, especially technical universities, practical technological and pedagogical processes, professional self-activation, non-standard solutions technologies form the basis of the article in the development of educational technology development education based on a competency-based approach with special emphasis on the professional component.

Introduction: Relevance and necessity of the topic. It is recognized that attention to the education system is necessary for all countries to develop the economy and ensure the welfare of society. At present, the development of the process of teaching specific sciences on the basis of new scientific and technical achievements, including the widespread implementation of a competent approach to improving the quality of teaching physics, is aimed at improving students' technical, information skills, creative and scientific thinking skills. serves to improve the application and technical skills of students, work with information, the formation of their creative and scientific thinking skills. Improving the quality of education through the use of innovative technologies in the teaching process in all disciplines related to physics, the development of creative abilities of students, increasing the effectiveness of practical applications of physics and the development of students' scientific approach to interdisciplinary communication and also it is important to increase the activity of students, to acquire independent knowledge and to apply the acquired knowledge in practice. Reforms in the system of higher education, the demand for competent personnel, create the need to form educational competencies in the teaching of physics in each subject, including physics.

The sources of information that today's students receive in the world are the textbook of higher education of the XIX century, the progressive opportunities of the teacher to receive information without limited time, the problem of inseparability of students from the Internet, its solution is to develop students' ability to extract scientific information that is needed in the future and today, rather than when they get a light understanding of what they like from a vast database; based on a competency-based approach to look at the student subject as an object of education and to increase its priority over other information, taking into account the content of education, the interests of students. Qualitative updating of the content of the education system, focusing on in-depth study of physics, development of pedagogical criteria based on the competencies provided for in the standard curricula. This substantiates the need to develop students' competencies and improve methods based on general competency approaches in physics, to determine the content of education and the composition of competencies in the development of students' competencies. Methods of teaching physics on the basis of a competency-based approach in higher education have been developed in the world's leading research centers and higher education institutions, including the National Institute of Technical Teachers Training Anol Research (India), England, Germany, the Russian Academy of Education, Tashkent State Pedagogical University.

As a result of reforms in science, education and industry in our country, the educational system, especially physics and its material and technical base is being updated and students are developing innovative aspirations. As a result of the introduction of teaching methods based on basic competency technologies, students' interest in their specialty is growing, and the real sector of the economy is being trained as qualified and competitive personnel. Naturally, there is a need for pre-planning of the educational process by university professors for the teaching of technical sciences based on the use of competency-based approaches. In the measures for the further development of physics education, "... the study of important and demanding subjects such as mathematics, physics, computer science and foreign languages on the basis of an in-depth competence approach" is identified as a priority. In this regard, creative competence-based approaches that develop creative activity in the teaching of kinematics, dynamics, statics, molecular physics, optics, atomic physics, which are an integral part of the physical sciences, design of teaching processes, as well as teaching based on advanced educational technologies, implementation of innovative ideas in education is the basis for the acquisition of knowledge about the results achieved in the field of nanophysics, atomic gliders, nanotechnology, the development of a system of training specialists in the technical field.

In higher education, a radical renewal of its structure, a radical change in the potential of professors and teachers, a self-aware, strong-willed, whole-faith, purposeful in life, consciously free and free with his own mind, his own ideology, his own work, his own responsibility cultivating a like-minded person is a major problem. So, to radically improve the system of higher education in our country, strengthen the material and technical base, increase the capacity of teachers, bring the quality of education to new levels, including the teaching of physics in accordance with world standards, the achievement of high results through the introduction of advanced pedagogical technologies is a solution to pressing problems. In teaching physics, the interest of children in technical devices, models, robotics, radio engineering, nanotechnology from an early age, as well as the continuous improvement of the quality and level of professional skills of teachers, once again justifies the need to improve their methods. Improving the system and mechanism is of paramount importance.

The scientifically based conclusions on the issues of consistent implementation of reforms in the field of higher education to improve the teaching of physics in higher education institutions on the basis of a competency approach are reflected in the reports and speeches of the President of the Republic of Uzbekistan Sh.M.Mirziyoev. These sources serve as a theoretical and methodological basis for research. The concepts of "competence" and "competency" originally expressed the need for interaction between scientists of different nationalities, and today the education system directly covers its content and practical essence.

Competence in higher education institutions, the theoretical basis for the development of professional competence, technical competence of technical engineers and its improvement are reflected in the scientific work of foreign scientists, including: in the scientific researches of such scientists as A.Maslon, M.Meskon, A.F.Khijinskaya, D.Brides, R.L.Dofn, V.Yu.Ziligostef. Teaching physics on the basis of a competency-based approach in higher education has been studied in the scientific researches of such scientists as D. Haynes, J. Ravel, J. Devor, G. Kholaj, B.A. Bodrov, L.N. Vashenko, A.N. Novikov, N.A. Rakova, A.I.Chimel, A.Hitorsky, B.B.Sidorenko in the countries of the Commonwealth of Independent States. Scientists of our country U.I.Inoyatov, N.N.Azizhujaev, K.Tursinmetov, A.Abdikodirov, Yu.M.Asadov, N.Sh.Turdiyev, M.Mirzaakhmedov, P.Nasriddinov, Yo.Najmiddinova, M.Matnazarova, Z.Alimardonov, M.Makhkamova, S.Kakhkhorov, B.Mirzaakhmedov, D.D.Begmatov, U.Muminkhodjaev, E.U.Eshjanov, A.Yusupov and other scientists worked on the competent approach of students in the republic and the organization of independent educational activities of students who have been working on career guidance.

Methods: The rapid development of modern scientific and technological progress, the expansion of innovative knowledge requires rapid renewal in the teaching of physics, the adaptation of future technical engineers in the modern world, the expansion and development of learning. Based on the study and analysis, it was identified that there are a number of tasks and challenges to further improve the quality of teaching physics in higher education on the basis of a competent approach: The purpose of teaching physics in higher education is limited by the State Educational Standard and the curriculum, the level of competence approach to students' knowledge and skills and their behavior are not developed, the teaching of topics is not improved in accordance with modern requirements. insufficient attention is paid to the development of independent thinking skills to form the ability to work independently on the basis of a competency approach, strong attention is paid to the organization of physics clubs based on the interests and needs of students, preparation for science Olympiads is not up to date; In particular, the relevance of research is the practical application of knowledge acquired by students as a result of teaching all branches of physics and the development of their skills, the formation of a well-rounded person who can work successfully in our rapidly evolving society. In the implementation of these problems: to identify and analyze the creative individuality, creative abilities of students, to develop creative inquisitiveness, to conduct their knowledge and skills independently on the basis of a competent approach, to form the characteristics of comparing a new problem with a previous one. examination of the conditions of knowledge, preparation for the creation of an author's program in creative work, overcoming the difficulties observed in the implementation of innovations in educational practice, the organization and conduct of practical work analysis, teaching students to self-analyze the requirements of the innovative environment; The preparation can be systematized as follows.

- Learning to read is to teach students the problems of learning activities, in particular, to strengthen the acquisition of knowledge and its application in practice, to teach them to find optimal ways to achieve goals.
- To be able to understand and explain the content of events, to understand the nature of natural phenomena, their causes, interrelationships and to understand them through relevant arguments.
- To be able to determine their own personal attitude and direction to the current problems of life and society, in particular, to understand and learn to solve problems related to science, politics, economics, ecology.
- To know the spiritual and cultural values, to treat them with respect, to learn to determine their position and direction in the world of different worldviews and interethnic relations.

In today's era of globalization associated with the unprecedented development of science and technology, the rapid growth of information, the importance of introducing best practices, innovative approaches and innovations in the field of education is growing. This necessitates the effective use of information that motivates students, increases their interest in the subject, and teaches students to think logically, as well as to provide interesting material from textbooks and manuals. Because there are so many external factors (elements) that affect the attitude of today's students to the environment, thinking, worldview, place in society, the formation of the individual as a whole, the issue of extracting the necessary information, effective use of existing databases is becoming a global problem.



In this regard, the development of the State Education Standard (SES) and curriculum in the Republic of Uzbekistan, based on a competency-based approach to science, aims to bring the level of knowledge of students to today's standards, to raise their knowledge, skills and abilities in personal, professional and social activities focusing on the formation of competencies in practical application.

Results and Discussion: The current level of demand for physics: the technical development of science, the field of production and its role in everyday life, the scientific outlook of students, the ability to think logically, intellectual development, the formation and development of self-awareness, their education and professional activity, the formation of their competencies is determined by their ability to apply the knowledge they have acquired today to tomorrow. The following is an example lesson on the development of basic and general science competencies in students.

In higher education, the chapter "Fundamentals of Molecular Physics and Thermodynamics" plays an important role in informing students about the fluid and its properties, and first of all, to increase their motivation to study. One of the main requirements for education today is the need for students to develop the ability to apply the knowledge they have acquired in life. In teaching science, 6 basic and 3 general competencies in physics were conditionally selected. These competencies need to be developed in each lesson and as its effective factors: the teacher's creative approach to each lesson; the competence of the science teacher and the need to increase the motivation of students to study (interest, desire, desire, devotion). Exactly one of these factors is to motivate students to study. The student of today's information age differs sharply from yesterday with his high demands, worldview, and high need for innovation. After all, this period in itself requires the necessary modern requirements, that is, competitiveness in all areas. The upbringing of a competitive person is a standard requirement set by the State. A competent

approach to education is carried out by arousing in students the interest, desire, that is, motivation to study, this or that subject. We try to motivate students by creating a problematic situation in the subject of physics in the formation of students' competencies on the topic "Fluid and its properties" and start the topic with simple life questions.



1. Which glass of water is saltier?
2. Ice, especially snowflakes, refracts light rays very strongly. What happens in nature if it refracts light less?

Which glass of water is saltier?		Ice, especially snowflakes, refracts light rays very strongly. What happens in nature if it refracts light less?	
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Comment on the pictures provided.

1. Formation of communicative competence

On the topic of 'Liquid and its properties', students will be able to express their ideas orally and clearly by listening to the basic properties, physical and chemical properties of liquids, the importance of water in nature and the human body, writing their chemical formula, knowledge of the relationship of physical phenomena to science, the naming of physical terms in other languages and a firm opinion based on their own knowledge, respecting the opinion of others, based on each physical phenomenon, concept and law in different problem situations, based on their knowledge and skills this competence is formed in the student through the ability to make decisions. For example:

Explain what properties of the liquid are shown in the picture.		Which of the given sciences describes the property of a liquid in a given picture?	
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Comment on the pictures provided.

2. Formation of competence in working with information.

This competence is formed by studying the topic "Fluids and their properties" by finding, selecting and effective use of sources of fluids, the analysis of the properties of fluids, in particular, the importance of water in human life, its use in everyday life. For example, "There is no mysterious liquid in nature like water. It has only its own characteristics.



- Water has a huge memory that can transmit information throughout the tissue and body.
- About 75% of the earth's surface is covered with water. Due to its high heat capacity, water absorbs most of the heat energy from the sun and protects it from overheating, "and students are given the task to remember and search for new information

Question content	The answer
Is it possible to make a fire with ice?	Yes, if you make a lens out of ice
What percentage of the human body and bones are made up of water?	Up to 70% water is in the body and up to 22% in the bones

Why does a small piece of iron sink into the water, but a huge ship can float on the surface of the water?	Remembering the law of Archimedes, the shape, size of the ship ...
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3. Formation of self-development competence

To strengthen the topic of "Fluids and their properties", to understand the ratio of surface water and land areas, salt and fresh water basins, rain and snow formation, the amount of fluid in the human body and its exchange process, the ratio of drinking water (water) in winter and summer to be able to substantiate, to form an independent intellectual approach to problem solving based on life-long learning, knowledge, experience about the importance of fluids in maintaining a healthy lifestyle.

1. What properties does a liquid exhibit in a physical phenomenon in a picture?		2. Explain how the given picture relates to the liquid.	
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Comment on the pictures provided.


4. Formation of socially active civic competence

Sensitivity to global problems related to our country and other countries, in particular, to the solution of problems leading to shortages of drinking water and motor fuels, to avoid excessive water wastage on the street, in higher education and at home, to keep the heat in the winter when using the heating system, this competence is formed by instilling in the minds of students a service to the interests of society, the family, with a good study of the liquid and its properties.

Which chapter and article of the Constitution of the Republic of Uzbekistan contains the following text: Citizens are obliged to treat the environment with care.	Chapter Eleven. Civic duties. Article 50
What sources of drinking water do you know?	<ol style="list-style-type: none"> 1. Rain and snow melt water; 2. Groundwater (wells, artesian wells) 3. Reservoirs (river, lake, ...)

5. Formation of national and cultural competence

In strengthening the theme "Liquid and its properties", this competence is formed in the students by the constant temperature of spring water in winter and summer, its composition, feeding of fish living in the spring of dissolved minerals, in particular, the careful preservation of the rich heritage of our ancestors - the cultural and architectural complex "Chashma" in Nurata and following the rules of etiquette established there, kindness, generosity towards others, respect for the worldview, traditions and ceremonies of others.

2	<p>What physical law was used to bring water to the Oqsaroy, built by Amir Temur in the fourteenth and fifteenth centuries, at a height of 38 meters.</p>	
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Comment on the pictures provided.

6. Mathematical literacy, the formation of competence

They perform the physical processes that occur in solving problems on the subject and in everyday life, using the necessary formulas, following precise calculations. In doing so, they will have the ability to leave their home at what time they arrive at school without ringing the school bell, and to plan in advance how to dress for school based on weather data. They can also make personal, family and economic plans based on accurate calculations. They are able to use them effectively in life, being aware of the latest scientific and technical innovations that lead to favorable conditions for people

1.	How many grains of rice are on average in one tablespoon? (± 25)	about 1100
2.	What is the name of a device that combines the capabilities of a monitor, processor, keyboard, mouse, and several other devices on a personal computer?	Sensor
3.	There are two 100-liter barrels. One is empty and the other is filled with water. Three different: 9-liter, 6-liter and 3-liter containers are provided. How can these containers be used to distribute 50 liters of water in each barrel?	By no means

The formation of general competencies in physics in students can be done as follows.

1. Observation, understanding, and explanation of Physical Processes and Events the topic of “Liquids and their properties” explains the phenomenon of evaporation and condensation through simple examples, such as fluidity, volume, crystalline state. The student uses knowledge, skills and abilities acquired in the properties of liquids in daily life, understands and explains the process. In particular: he or she understands and explains the state of aggregation of water, the importance of maintaining the stability of the earth's surface and the human body, the solubility properties of liquids, the process of technical use of liquids. In addition, the student observes, understands and explains the process of seasonal change in nature, the formation of snow and rain. In doing so, the student is able to articulate his or her point of view clearly and concisely orally and in writing, ask questions logically based on the topic, and work collaboratively as a team while adhering to a culture of communication. By observing this process, students learn throughout their lives, constantly increasing their knowledge and experience independently, and this competence is formed.

1. Is it easier to swim in clean water or in salt water?	Swimming in salt water is easy because salt makes the water much heavier.
2. If we put a watermelon first in a bath filled with clean water and then in a bath filled with very salty (wet) water, what is	The volume of the overflow water varies, not the masses.

the ratio of the masses of water overflowing from them?	
3. Which retains heat better: clean water or salty water?	In this case, the salty water cools faster.

2. Conducting experiments, and drawing conclusions

In the course "Liquid and its properties" students are taught about the volume, density, mass, heat capacity, formula, units of liquids and how to measure them. Topic reinforcement questions are given in order to measure, identify, and apply physical quantities in practice. Including: evaporation and boiling temperatures of water, the amount of hot water and cold water when filling the bath for bathing, the effect of relative humidity on respiration when declaring the relative humidity of the air in millimeters of mercury in weather data draws conclusions based on the knowledge, skills and abilities acquired by the student during the course. They can measure the required physical quantities using scales, thermometers, psychrometers, calorimeters.



Conduct experiments, measure physical quantities and draw conclusions.

3. Be able to use physical tools in practice

The topic "Liquid and its properties" provides knowledge about the temperature of a liquid, its physical size, unit, their scales, which determine the thermal state of a substance, and what instruments are used to measure temperature. At the end of the topic, the practical task is to provide information about the role and importance of fluids in the operation of excavators and cranes, heating buildings. This competence is formed by knowing the scales of thermometers, barometers, manometers, measuring quantities and their types, as well as the practical application of physical knowledge.



Be able to use physical tools in practice

Of course, creating competency-oriented assignments requires a great deal of effort on the part of the teacher. Things like making cards, writing and copying texts, checking that assignments are done reading stories take a lot of time and paper. However, the fact that once prepared materials

can be used in the following years in an enriched way, the formation of competencies in students, the increase in their interest in science, rewards the work of the teacher.

Conclusion: Scientific and practical significance of the topic. The scientific and practical significance of the topic proves that the methodological system can be used in higher education in the teaching of physics and engineering on the basis of a competency-based approach; Introduce future technical professionals into personal economic and professional relationships for the rest of their lives; To take one's place in society; Solve problems encountered in processes; To be competitive in their field and to create innovative ideas; As a result, the student acquires basic competencies, including communicative, information skills, self-development as a person, mathematical literacy, knowledge of science and technology. Communicative competence in schools and higher education institutions: Excellent oral and written communication, written and oral answers to structured questions, ability to express one's opinion clearly and concisely, work with additional literature and use them to create tests and questions, work in groups, to be able to defend their point of view, to persuade, to be self-directed in solving problems, to master foreign languages in addition to the native language. To form communicative competence

- Regular work with the textbook.
- Ability to work on text.
- Find answers to questions using the topic.
- Ability to perform practical tasks.
- The methodology of the need to create an electrical circuit and graphics using the materials of the subject was developed.

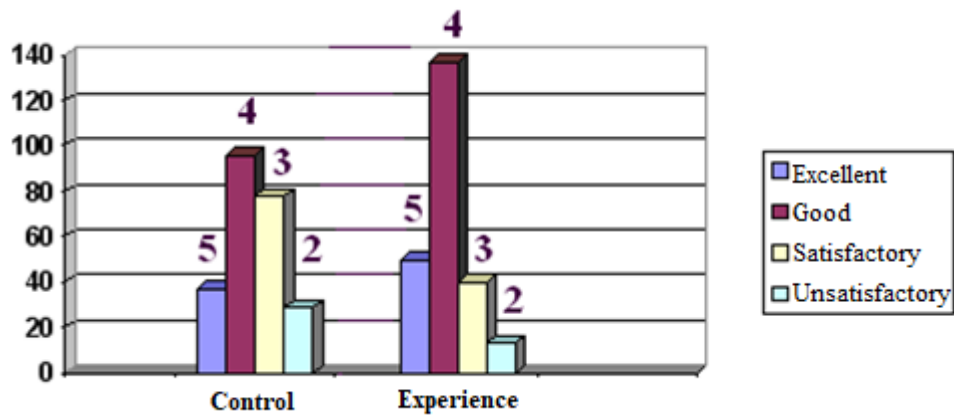
Experimental tests were conducted to determine the effectiveness of students' knowledge on the topic of technology to improve the methods of teaching physics in higher education institutions on the basis of a competency approach (on the example of training technical engineers), including:

At the annual scientific theoretical and methodological conferences of Termez State professors, the Termez branch of the Tashkent State Technical University named after Islam Karimov, the Department of Physics and Teaching Methods of Karshi State University.

The use of modular technology of activation of didactic interactive means of information and technical support of physics education was used to increase the effectiveness of the competency approach to education based on the basic competencies of competence, communicative, self-development as an individual.

Improving the effectiveness of physics serves to increase the knowledge and competence of methodological training of future technical specialists in higher education institutions. The results of the statistical processing of the experimental results were summarized and described in the histogram. The following results were obtained from the computational work for T-statistical observation:

- ❖ $T_{\text{observation}} = 8.7;$ $T_{\text{observation}} > T_{\text{criterion}} = 7.81;$
- ❖ $T_{\text{observation}} = 8.78;$ $T_{\text{observation}} > T_{\text{criterion}} = 7.81;$
- ❖ $T_{\text{observation}} = 11.56;$ $T_{\text{observation}} > T_{\text{criterion}} = 7.81;$



Histogram of the results obtained

As a result of the coverage of the topic of technology for improving the teaching of physics in higher education institutions (on the example of the training of technical engineers) on the basis of a competency approach, the following conclusion was reached.

Scientific novelty of the research: It was improved by the content of the components of the competent approach (innovative activity of the professor, independent learning, understanding, memory, application and control) to the methodological system of teaching physics and engineering (purpose, content, form, means and methods), development and improvement of the structure of the dialogue between faculty and students on the basis of expansion, development of problem-solving indicators (type, essence, classification, characteristics) of interdisciplinary and basic subject competencies (order, membership, application), planning stages of lessons according to the technology "Person-centered education", "Brainstorming", "Didactic game", checking mastery, giving priority to the dynamics of physical knowledge (coordination activity, learning activity, practical activity); scientific and methodological recommendations for the study of physics based on the integration of the activities of faculty and students based on competent approaches that create a creative environment (innovative activities of teachers, independent learning, practice, comprehension, memory, application and control) improved by clarifying the requirements for lessons in the formation of basic and general science-related competencies according to the interactive approach of student-oriented course forms.

Conclusions: 1. The state policy on the development of science in higher education institutions of the Republic of Uzbekistan is based on a new education system, changes in the training of technical engineers, a new approach, a competent approach to educating students, educating them to compete with their peers, society and successful participation in life and requires that it be no less than its peers on a reciprocal scale. It should be noted that combining creative, scientific power and building a great scientific and innovative potential has become an urgent scientific and practical necessity.

2. The experiment identified criteria and indicators for improving the training of future technical engineers on the basis of a competency-based approach to teaching physics in higher education institutions and developed a methodology and used various non-traditional methods to determine the level of knowledge of students. Educational and practical materials have been developed for all sections of physics. The sections of physics of mechanics, molecular physics, electronics, optics, atomic and nuclear physics were analyzed as a whole. Students' knowledge was assessed as excellent, good and satisfactory, unsatisfactory. It was confirmed that students have the skills

to apply theoretical knowledge in practice during lessons and clubs. It has been proved that in higher education institutions it is necessary to pay attention to the effective use of a competency-based approach, the development of communicative, self-control, activation and mathematical literacy.

3. The interest of students in the profession of the processes aimed at the development of methods of teaching physics on the basis of a competency-based approach in higher education is based on the existing structure that provides the development of intellectual, practical, emotional, volitional, organizational and communicative functions.

4. The comparative analysis of the component activities of students in the teaching of physics, the stages of implementation of methodological approaches, the elements of the educational process of traditional competent approaches (purpose, content, form, method) of the student and the teacher.

5. According to a study devoted to the study of the essence of professional, technical-engineering creativity, innovation, self-development, active civic competencies in the study of physics, it was found that the professional component is constantly evolving and is the result of the student's self-process.

6. The student's social and personal qualities are embodied in the process of creating innovations. Individual stratification, teamwork, responsibility, organization of group work, the ability to express their views, the organization of its development have been created and put into practice.

Suggestions and recommendations: It was recommended to study the experimental teaching materials of future technical engineers in the course of teaching physics, to conduct experiments for the organization of independent creative work and to put them into practice. Effective organization of independent work at home, both in the classroom and outside the classroom, served to develop competencies independent thinking, creative work skills, self-control competencies, increase the theoretical and practical significance of research work. Experimental work was analyzed through a competency-based approach to physics. Through the competency approach, non-traditional methods of teaching physics were found to be more effective than the traditional approach, the results obtained confirming the effectiveness of the experimental work and the fact that the experimental work was set correctly, the research was done correctly. As a result of research and experimental research, a methodology for teaching physics on the basis of a competency-based approach has been developed, proven to increase students' knowledge, methodological recommendations and manuals have been developed.

Note: The object of the topic is the process of developing students' technical creativity by developing a methodology for teaching physics on the basis of a competency-based approach.

The subject of the topic is the improvement of the content of the components of the competency approach (innovative activities of the teacher, independent learning, thinking, memory, application) to the methodical system of teaching physics on the basis of the teacher-student relationship and the methodology of developing students' competence on the basis of teaching.

Methods of the topic: In the research process, the methods of observation, comparative analysis, experiment, questionnaire, test, interview, physical and statistical analysis of the results were used.

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