

Ministry of Higher Education, Science and Innovations of The Republic
of Uzbekistan Termiz Institute of Engineering and Technology

Improving the Methodology of Teaching Physics in Technical Higher Education Institutions on the Base of A Competent Approach

By

Abdullayeva Barno Sayfuddinovna

Sultonova O'giloy Nabievna

Abdullayeva Dilsora

Xaliyarov Jasur Xidirovich

Paluanova Anifa Daribaevna

mp mahi
Publication

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, resold, hired out, or otherwise circulated without the publisher's prior written consent in any form of binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser and without limiting the rights under copyright reserved above, no part of this publication may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means (electronic, mechanical, photocopying or recording) otherwise without the prior written permission of both the copyright owner and the above-mentioned publisher of this book.

Inquiries for bulk sales may be solicited at mahibookpublication@gmail.com

FIRST EDITION: 2024

ISBN: 978-93-6678-201-0

Price : ₹ 999/-

Mahi Publication

153, Bariya Street, Near Shree Swaminarayan Mandir,
B/H Jain Derasar, Ambli, Dholera, Ahmedabad, Gujarat -382463

Phone: +(91) 90238 45578

Website : www.mahipublication.com

E-mail: mahibookpublication@gmail.com

Copyright © 2024/MAHI PUBLICATION

This monograph is recommended for use as a methodical guide for students of Termiz Institute of Engineering and Technology, teachers and students of pedagogy.

Responsible Editor

Doctor of Pedagogy and Psychology, Professor B. S. Abdullaeva.

Reviewers

Doctor of Physical and Mathematical Sciences Prof M. Yusupov.

Doctor of Physical and Mathematical Sciences Prof. B.E. Toraev

The monograph was recommended for publication on the basis of the report No. 17/2-2 dated August 8, 2024 of the Scientific and Methodical Council of the Termiz Institute of Engineering and Technology.

Year 2024





Introduction	7
UNIT 1	8
THEORETICAL AND METHODOLOGICAL BASIS OF IMPROVING THE METHODOLOGY OF PHYSICS TEACHING ON THE BASE OF A COMPETENT APPROACH IN TECHNICAL HIGHER EDUCATION INSTITUTIONS	
1.1. The current state of the competence approach in teaching physics in technical higher education institutions	8
1.2. Psychological and pedagogical foundations of competence development in physics education	23
1.3. Basic and subject-related competencies to be improved in students in teaching physics in technical higher education institutions	33
UNIT 2	54
THE DIDACTIC SYSTEM OF PHYSICS TEACHING IN TECHNICAL HIGHER EDUCATION INSTITUTIONS BASED ON THE COMPETENT APPROACH	
2.1. Application of pedagogical technologies in improving physics teaching based on the competence approach	54
2.2. Methodology of individual and differentiated approach to improvement of basic competencies	67
2.3. Use of practical educational issues aimed at developing students' competences in physics	77
Conclusions on Chapter II	99

UNIT | 3 _____ **101**

METHODOLOGY OF TEACHING PHYSICS IN TECHNICAL HIGHER
EDUCATION INSTITUTIONS BASED ON THE COMPETENT APPROACH

3.1. Organization of independent educational activities of students
based on the competence approach and its effectiveness _____ 101

3.2. Methodology of using educational technologies in the development
of students' competence _____ 118

3.3. Organization of physics club training aimed at developing students'
competence _____ 132

Conclusions on Chapter III _____ 146

UNIT | 4 _____ **147**

ORGANIZING AND CONDUCTING THE PEDAGOGICAL EXPERIMENT-
EXAMINATION

4.1 Pedagogical experiment-test purpose and tasks _____ 147

4.2. Pedagogical experiment results and their analysis using
mathematical and statistical methods _____ 162

Conclusions on Chapter IV _____ 176

Recommendations _____ **180**

List of References Used

Regulatory documents and publications of methodological importance _ 181

|| Introduction

Relevance and Necessity

In the world, in the conditions of the digital economy, the mechanisms of improving the methodology of teaching physics based on the competence approach have been implemented in higher education institutions. In 2015, the Incheon Declaration "Education-2030", which ensures the sustainable development of education, was adopted at the world forum held in South Korea, and creating the opportunity to receive quality education throughout life was defined as an urgent task. In technical higher education institutions, systematic work is being carried out to improve the methodology of teaching physics based on the competence approach, to increase the quality of didactic provision, to develop the creative thinking of students, to use modern educational technologies, and to satisfy the need for creative and competent specialists.

World educational and scientific research institutions are conducting scientific and research work on the development of physics education, the wide use of induction and deduction methods in physics teaching, the implementation of an international evaluation program, an integrative approach to physics teaching, the modernization of educational content, and the introduction of innovative information technology into education. At the same time, special attention is being paid to scientific-research works aimed at issues such as developing students' ability to think creatively, developing professional competence, introducing information technologies in physics teaching, and ensuring the harmony of theory and practice in teaching.

In recent years, in connection with the development of information technology, the regulatory framework for the implementation of new forms of training organization, the improvement of the quality and efficiency of education and the possibilities of educational services, and the training of highly qualified personnel in accordance with the modern needs of the labor market have been created in our republic. In-depth teaching of sciences , creation of an effective mechanism for putting scientific and innovative achievements into practice priority tasks. This expands the possibilities of improving the methodology of teaching physics based on the competence approach in higher education institutions.



UNIT | 1

THEORETICAL AND METHODOLOGICAL BASIS OF IMPROVING THE METHODOLOGY OF PHYSICS TEACHING ON THE BASE OF A COMPETENT APPROACH IN TECHNICAL HIGHER EDUCATION INSTITUTIONS

1.1. The current state of the competence approach in teaching physics in technical higher education institutions

The issue of education is a process that constantly adapts to the requirements of the times and improves in harmony with scientific and technical achievements. One of the unique aspects of the educational system of the 21st century is the demand for students to be able to apply the knowledge they have acquired in higher technical educational institutions in life, the improvement of their training programs and programs, in other words, the integration of the competence approach into the content of the educational system, and the formation of the concept of achieving its educational results.

The decision of the President of the Republic of Uzbekistan dated March 19, 2021 "On measures to improve the quality of education in the field of physics and development of scientific research" No. This requires improvement of the content of the teaching methodology of physics based on the competence approach.

In the Address of the President of the Republic of Uzbekistan Shavkat Mirziyoyev to the Oliy Majlis, "If we look at history, we see that physics was the fundamental basis for the creation of almost all discoveries and technologies in the world. In fact, without a deep understanding of the laws of physics, it is impossible to achieve results in today's demanding areas such as mechanical engineering, electrical engineering, IT, water and energy-saving technologies [7].

Based on the analysis of materials related to the competence approach in education, the following information can be given. "competence" and "competence" began to enter the

scientific literature for the first time. For example, in relation to the theory of linguistics, the American linguist N. Chomsky used the term competence in his work entitled "Aspects of the Theory of Syntax". it is the ability to perform activities" [35].

G.A. Asilova summarizing the definitions of the concepts of "competence" and "competence" in her thesis, "competence" is the effective use of personal qualities and knowledge, skills and abilities in the process of working in a certain field; defined "competence" as an existing and emerging ability to perform certain activities [41, 42]. J.E.Usarov in his scientific works defined competence as "experience and knowledge in a certain field or direction, manifestation of readiness to perform activities, and a person's ability to act successfully in various non-standard situations" [31, 163].

According to B.Kh. Khodzhaev, "competence serves to integrate self-development efforts to master new personal experience".[170; p. 101]. N.A. Muslimov [114, 115] emphasizes that competence is not the acquisition of separate knowledge and skills, but the acquisition of integrative knowledge and actions in each independent direction.

Methods of diagnosing and correcting the formation of competencies Yu . Asadov [40], N. Turdiev [156, 157, 158], S. Akbarova, D. Tumirov, systematized and described in research works [40]. R. Fayzullaev [32; p. 9-11] conducted research aimed at solving problems related to the development of information competence in the educational process.

Many scientists and specialists have expressed their opinion on the concepts of competence and competence. For example, in the monographic work "Competence in modern society" by J. Raven: "it consists of a large number of components, many of which are independent of each other ... some components belong more to the cognitive sphere, others to the emotional sphere .. [68]. These components can complement each other in effective self-management. J. Delor in his speech "Education - a hidden treasure" at the International European Council on Education in the 21st Century explains "the four pillars on which education is based": learning to know, learning to do, learning to live together, learning to live [68].

These concepts reveal the main content of competence. J. According to Delor, learning to perform means not only having a professional qualification, but also being competent in a broad sense, that is, being able to work in groups and successfully get out of many complex situations that arise during work . It should be noted that together with the concept of "competence", there are cases where the term "skill base" is used as its synonym [68].

In particular, A.K. In the works of Markova, professional competence was considered as a special subject in the context of labor psychology [98], while the works related to teacher competence were put forward by L.A. Petrovskaya [122, 123, 124], N.V. Kuzmin [25] and others.

Although the content of the accepted competences has been developed, relevant suggestions and recommendations have been given, the definitions given to them are wide and diverse, and at the same time, they all cover certain directions. V. I. Baydenko suggests making some changes in the definition of the concept of competence. This set of components allows a person to set a goal, achieve success and develop in the specified field of activity. The following conclusions can be drawn from these concepts. Competence is experience and knowledge in a certain field or direction, manifestation of readiness to perform activities, and a person's ability to act successfully in various non-standard situations. This definition given to the concept of competence shows the knowledge and experience acquired by a person in the process of study [48].

A.A.Verbitsky [18] and O.B.Ermakova [18] believe that the competence approach is "the main way to improve the quality of general secondary and higher education, and confidently occupies the position of the main methodology in its modernization" [18]. These authors emphasized that the following considerations are important for all links of the pedagogical system to successfully involve the educational system:

- Changing the structure and content of education: moving from theoretical concepts collected in different academic subjects, separated from each other, to methods that give a universal idea about the environment and implement it through practical and social skills;

- Changing the approach to the purpose and results of education: from simple assimilation of the received information by students to social and intellectual culture, to the qualitative formation of the image of the human environment;
- Making changes to the structure of the teacher's pedagogical activity: switching from a one-sided presentation of the educational material to conducting a dialogue with students; effective development of student personality;
- Introduction of the competence approach to the environment of higher education; media, social being, family, country, culture, etc. making changes; technological supply reform;
- Transition to innovative technologies aimed at the development of student activity; strengthening the organizational, personnel, material-technical and financial support of the educational system [18].

The requirement for students to be able to apply the knowledge they have acquired in life in technical higher education institutions is the improvement of their training programs and programs, in other words, the integration of the competence approach into the content of the educational system, the formation and development of the concept of achieving its educational results. The origin of these requirements is the need to update the teaching system in technical higher educational institutions, the fact that technical higher educational institutions did not satisfy the public, although they can demonstrate the knowledge they have received, but they are not ready to work independently to apply it in their daily and future activities.

According to A.I. Subetto, the competence approach can be considered as an addition to the existing system of knowledge, skills and qualifications. Based on the European experience, it can be noted that the effective use of the competence approach in the higher education system today provides an opportunity for comprehensive development of the individual. It should be noted that the concept of competence approach, which appeared in the next decade for the European education system, is a novelty for the Uzbekistan education system. The emergence of the term "competent approach", in turn, affected the question of revising the existing system of categories of pedagogy [143].

Education based on the competence approach is today a topic that causes some conflicts, contradictions and different opinions due to its insufficient scientific and methodological research. Currently, there is no stable definition of competence. The concepts of competence and competence are interpreted differently. For example, in the "Encyclopedic Dictionary" authored by B.A. Vvedensky, the following definition is given: "Competence is the range of powers, the range of questions acquired by this person through his knowledge and experience", that is, the knowledge that a person can discuss and has in this or that field of activity. [17].

In education based on the competence approach, the student becomes the main participant in the educational process with personal goals and tasks. This approach makes it possible to engage the student in active, conscious activities, develop informational, communicative, educational and cognitive skills, personal potential, form self-esteem, and develop self-management skills (Fig. 1.1).

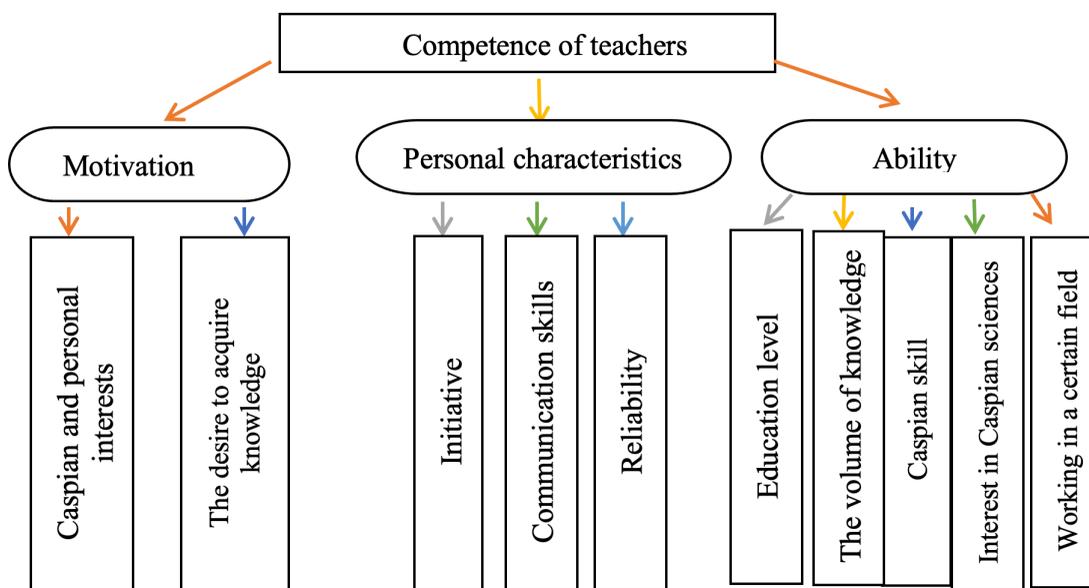


Figure 1.1. - a picture. Interdependence of elements of student professional competence.

A student's ability is shown through his competence. The combination of student's qualities, motivation, ability can be shown in vector form as follows and analyzed as a set of its composition, knowledge, skills, qualifications and professional competence (Fig. 1.2).

The purpose of teaching physics based on the competence approach in technical higher education institutions is limited to the goals of the DTS and the curriculum, and the student's knowledge, skills and abilities are connected with the understanding of the purpose and means of implementation of the competence approach.

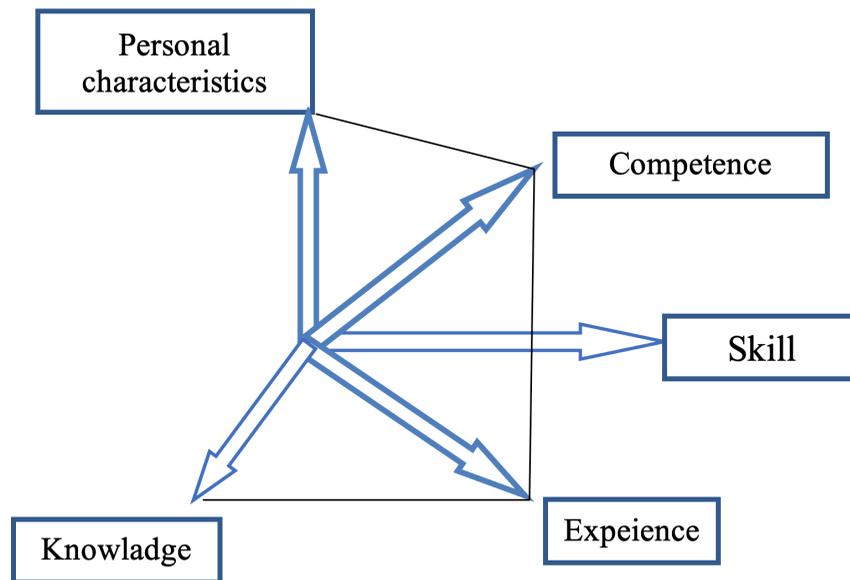


Figure 1.2. Vector form of student competence.

According to the above, different views on the concept of competence prove that this concept should be interpreted as a complex structure. This structure includes the following elements: acquisition of necessary knowledge, skills and competences; personality characteristics that determine the ability to perform some activity; a set of professional characteristics; acquisition of relevant competencies.

The above mentioned I.A. Zimnyaya [20, 21], V.V. Kraevsky [24, 91], V.V. Serikov [138, 139, 140, 141], A.I. Subetto [143], N. Chomsky [35], A Relying on the definitions of V.

Khutorskoy [171, 172, 173] and others, in this research we understand competence as the ability of a person to realize himself effectively in some activity based on the formed competencies.

The following basic competencies are distinguished in the Austrian education system: competencies focused on personal development; social and occupational competences. Competencies related to activity in a certain field include: "Language and communication", "Creativity and design", "Man and society", "Health and movement", "Nature and technology". Social competences include communication skills, the ability to work in harmony, the ability to resolve conflicts, understanding others, initiative, and social responsibility.

Formation and development of competencies in students are divided into the following three types:

1. Metasubject competencies (basic competencies).
2. Interdisciplinary competencies.
3. Competencies related to science.

Metasubject competences mean "before the subject", "on the subject". The reason for this is that in order to successfully live in society, a person must have certain abilities, skills, and abilities. In particular, to be able to express one's opinion fluently and in writing verbally and in writing, to be able to find and use the necessary information, to be active in society, to constantly develop one's self, etc. properties are required [156, 157, 158].

The optimal version of basic competencies was developed by A.V. Khutorsky [171, 172, 173]. According to it: dignity, belief competence, general cultural competence, educational competence, information competence, communicative competence, social work competence, competence of personal improvement [171, 172, 173].

In the European education system, it is appropriate if the competence of students studying in higher education is evaluated according to the results achieved in the following three areas:

1) personal results; 2) results according to systematic activity; 3) results in academic subjects. This requires the educational system to be based on a competency-based approach.

Thus, in the 20th and 21st centuries, foreign scientists associate the improvement of the quality of education with the concepts of "competence" and "competence", and the competence approach, which allows to align the goal of education with all subjects of the educational process, has become widespread. In this, principles such as increasing students and their motivation and ensuring the unity of the educational process are given priority. First of all, the competence approach creates conditions for the formation of the ability to acquire knowledge and use the acquired knowledge in their personal lives in the system of technical higher education institutions. Secondly, in the context of this approach, competence reflects the result of mastering scientific competences and the ability to use them in practice, and competence is manifested in the form of a set of professional or functional descriptions of a person.

The technique requires a new scientific approach to the competence approach in higher education institutions, and it was found that the following problems exist: that the teaching of the specified subjects related to physics departments in accordance with the educational content of curricula and science programs based on the competence approach to technical higher education institutions is not improved based on the requirements of the time; the lack of attention to the formation of students' independent work skills based on the competence approach and thus to the development of their independent thinking skills; the lack of attention to the organization of physics circles based on the needs and interests of students based on the requirements of physics and technical sciences education in technical higher education institutions;

In the teaching of physics in technical higher education institutions, the number of hours allocated to the sequence and topics does not correspond to the educational content, volume and its time distribution.

A component of universal culture in students is the formation of literacy competence, the formation of independent work skills and basic competence of students on a specific topic during the training process itself.

As our country is undergoing innovative development, it has all the necessary conditions for transitioning to the modern model. Creation of this model requires wide and effective use of scientific and technical potential, use of achievements of fundamental and applied sciences and deep knowledge. Implementation of technologies is based on increasing the number of highly qualified national personnel.

In the conditions of continuous education, the task of training competent personnel who can manifest their identity in life activities, take an active attitude to change society, and influence them, becomes a priority.

There are also a number of issues that need to be resolved in order to implement DTS and training programs based on the competence approach [8]. In particular, what methods and teaching technologies can effectively form and develop students' competencies, are students ready for this? Are the contents of the textbooks, virtual laboratories, and practical lessons taught in technical higher education institutions aimed at the formation and development of students' competencies? From this point of view, it is necessary to develop and put into practice the scientific-methodical, psychological-pedagogical foundations, didactic and methodical tools and methods of the competence approach in the educational system. Acceleration of labor market changes, globalization of the information environment, inability to meet the demands of students with the old approach is clear as day.

Competence requires constantly enriching one's knowledge, learning, feeling the demands of the times, applying the skill of searching for new knowledge in one's practical work. A specialist with competence will be able to choose suitable methods for solving problems, reject inappropriate ones, and have the ability to look at the problem with a critical eye. Competence in the field of technology is a set of personal qualities of a technical expert. If future technical experts are armed with basic, general, and specific competencies, they will begin to search for new innovative experiences, create the scientific basis of new creative works, create innovative ideas, and on this basis, society will become an innovator in the development of technology.

Takes control of educational results based on the competence approach, that is, the technique consists in evaluating the readiness of the student to apply the knowledge, skills, competences and competences obtained by graduating from higher education

institutions in familiar and unfamiliar situations encountered in life. Therefore, the application of the competence approach in each technical higher education institution serves as a solution to current problems.

Based on the analysis, it can be said that the word "competence" comes from the word "Competence", which means "to compete", "to compete" or "ability to compete". According to scientific psychological and pedagogical sources, competence, competence is very complex, and multi-part. That's why its interpretations are different according to its content. The concepts of "competence", "competence" are paid special attention to the following cases:

Practical application of knowledge; student's education, character qualities;
Readiness for practical activity; the ability to achieve the necessary results in problem-solving practice; that the student has created a source of knowledge necessary for his work.

In the Republic of Uzbekistan, the following basic competencies are formed in accordance with their age characteristics, based on the continuity and integrity of education, the priority of the student's personality and interests:

- Communicative competence;
- Information processing competence;
- Self-development competence;
- Socially active civic competence;
- National and universal competence;
- Mathematical literacy, awareness and use of science and technology innovations i [8].

The students' knowledge, skills, competences and competences in physics are considered to be the ability to understand the discoveries and scientific innovations encountered in everyday life, to use them in solving theoretical and practical problems, and to observe and understand physical processes and phenomena (mechanical movement, interaction of bodies, motion of a material point in space, rotation, forward movements, molecular-kinetic theory, gas laws, movement of liquids and gases, evaporation, boiling, condensation rules, real gas laws, solid body properties, thermal phenomena, vibration and waves, electrification of bodies, interaction of charges effect, short circuit, earth's

magnetic field, electromagnetic induction phenomena, solar and lunar eclipses, change of seasons, planetary motion, observation of meteorites) and apply knowledge.

The main functions of competencies are:

reflection of social requirements for living in everyday life;

comprehensive and purposeful application of knowledge, skills and abilities, as well as activity methods;

solving problems;

know how to use theoretical knowledge in practice in laboratory work.

The question arises in what order should the competencies be placed? Some competencies are more general and more important than others, and they fit all three purposes.

1. Basic competence - educational content.
2. General sciences - academic subjects and the field of education.
3. Related to science - formed within the scope of science.

By imparting knowledge to students on the basis of a competence approach, all departments of "Physics" prepare theoretical knowledge of students to solve problems arising in their future specializations (see Figure 1):

Table 1.1 It is formed through physical competences as follows

	Departments of Physics	Mechanical Hodysseys
	The main theoretical q name	Fundamentals of kinematics of " Physics" connec- tion with other sciences. General information about mechanics. The coordinate system is the movement of a point along a straight line. The main task of dynamics is Newton's laws of universal gravitation, conservation laws in mechanics. Mechanical work, energy, power, momentum, conservation of energy. The structure of the rocket. Conditions of equilibri- um of bodies. Mechanical vibrations, harmonic vi- brations. Spring mathematical and physical pendu- lums. Mechanical tires , longitudinal and transverse tires .Poy n ting vector. Sound waves

1	Competence to observe and understand processes and phenomena	Mechanical movement, interaction of bodies, transmission of pressure in liquids and gases, observation of mechanical vibrations and waves
	Measurement and determination of quantities	Measuring and determining time, distance, speed, mass, density, force, pressure, work power, energy, oscillation period and frequency
Competencies	Explaining the process and events	Mechanical movement of bodies interaction, pressure transfer in liquids and gases, Newton's laws, laws of universal gravitation. Laws of conservation of momentum and energy. Guk q him
	Conducting experiments and drawing conclusions	A straight line is a path traveled in a straight and uniformly accelerated motion. Carrying out experiments and drawing conclusions on the dependence of the elastic force on the spring elongation, the working force on the normal compressive force, and the equilibrium conditions of the lever.
	Explain the principles of operation of physical devices and the structure of technical objects	Stopwatch, length measuring device, scales, dynamometer, barometer, hydraulic press , operation of simple mechanisms
	Consolidation of theoretical knowledge and practical application of physical knowledge	T straight, accelerating, rotating, forward movements. Newton's Laws, Universal Laws of Gravitation. Gravity, elasticity, working forces. Mechanic work power, energy, impulse, moment of force, simple mechanisms, mechanical vibrations, Solving problems, using electronic development and electronic textbooks, Internet and other tools from popular scientific literature to strengthen the knowledge gained about the subject. And measure q t, distance, speed, mass, work, forces. Application of knowledge, skills and abilities from Newton 's, Pascal's and Archimedes ' laws in everyday life .

Thermal phenomena		
	Ammunition that you need to own	The structure of matter, thermal behavior of molecules, temperature, ideal and closed liquid. Bernoulli's equation. Poiseuille 's formula, molecular - kinetic theory, isoprocesses. Maxwell 's wiring, internal energy, laws of thermodynamics, Van-Der-Waals equation of real gases. Conversion of gases to liquids and the Joule-Thomson effect. Amount of heat. Average kinetic energy of molecular thermal motion, Barometric formula. Boltzmann 's symmetry
	Competencies Observing and explaining processes and events	Matter, change of state of aggregate, pipe flow of liquid, Poiseuille 's formula, thermal behavior, thermal behavior of molecules
	Check physical properties identify numerical values	Measurement of temperature, heat, specific heat, humidity
	Explain the physical nature of processes and phenomena	Mod d a aggregate state change. Atomic - molecular structure of matter, laws of thermodynamics, laws of conservation of energy
competencies	Conducting experiments and drawing conclusions	change during heat exchange, isoprocesses, thermal movement of molecules. Adiabatic process, crystal lattices
	Explain the principle of operation of physical devices and the structure of technical objects	Thermometer structure, psychrometer, internal recording engine, this is a g' tube structure

Consolidation of theoretical knowledge , application of physical knowledge in practice	Solving problems to strengthen theoretical knowledge about the size and mass of molecules, the amount of matter, molar mass, the basic equation of the molecular-kinetic theory, the amount of heat, the specific heat of combustion of fuel, solving problems, completing test tasks, from scientific literature, the Internet, electronic development, electronic textbooks, virtual use of laboratories. Study of melting and solidification of solids, internal energy and work, evaporation and condensation
Electromagnetic odysseys	
Ammunition materials	Electrification of bodies, Coulomb's force, Gauss's theorem, electrostatic field potential. Electrical equipment, capacitors. Current flow in conductors. Ohm and Joule-Lenz force, magnetic field, Bio-Savar - Laplace force, Lorentz and Ampere forces
	of matter. Types of magnets. Law of electromagnetic induction, inductance, transformers, Maxwell's equations for electromagnetic field. Electromagnetic vibrations, electromagnetic waves. Poynting vector
Process and event monitoring	Electrification of bodies Remove the magnets interaction. Effect of magnetic field on current conductor. Thermal effect of Joule. Observation of electromagnetic induction.
Measurement and determination of quantities	Measurement of current, voltage, capacitance, capacitance, work and power

Explaining the process and events	ng charged bodies interaction, effect of magnetic field on current conductor, heat effect of current, electromagnetic phenomena
Conducting experiments and drawing conclusions	Series , parallel and mixed connection of conductors, experiments on the dependence of current on voltage in one part of the circuit
The working principle of physical devices and their practical application	Current, voltage, electrical resistance, Ohm's law for a part of a circuit, series and parallel connection of conductors. Voltage, electrical resistance, resistivity. Application of the acquired knowledge, skills and abilities on the work and power of electric current, transformation of alternating current in life and technology.

Optics, atomic and nuclear physics sections of physics are studied divided into competencies. Therefore, physics students should know and be able to apply: concepts, physical quantities, physical laws, physical phenomena that need to be explained, measurement, obtaining results, demonstrating theoretical knowledge, independently searching for information, being able to apply it in practice, student competence in physics, observing processes and events, measuring and determining quantities, explaining processes and events, conducting experiments and drawing conclusions, the principle of operation of physical devices, practical application of physical knowledge.

Therefore, in the competency-based approach to teaching physics, the requirements for the volume and quality of the students' educational loads are revised based on the competencies that the students should acquire. Skills and competencies acquired by students serve the formation and development of competencies. Ability to apply acquired knowledge in finding situations. Competence is the ability to apply learned knowledge, skills in unfamiliar situations, and understand how to generate new knowledge. Competence is the ability to use existing knowledge, skills and abilities in daily activities [106].

It is important to create a pedagogical environment that affects the comprehensive development of the student (see Table 1.2).

Table 1.2 Creating a pedagogical environment that affects the comprehensive development of the student.

Creating a pedagogical environment that affects the comprehensive development of the student	The knowledge and skills that students need to acquire, thinking, understanding the world, researching it, studying its processes, events, situations, laws and rules, etc.
To promote: "I want", "I can do", "I feel satisfied", "I am liked"	
Within this approach, comprehensive development of personality, sphere of activity and emotional state are discussed.	

In order to organize the development of the student's mind, it is necessary to see every achievement, for this it is necessary to offer such tasks and problems that the student can complete it.

Students should feel the need to read additional literature, familiarize themselves with it and prepare, and understand that the need to acquire knowledge is based on the fact that it is possible to create large technical projects and implement it [56, 56].

1.2. Psychological and pedagogical foundations of competence development in physics education

In order to determine the main directions of formation and development of basic and science-related general competences, the concepts of education and upbringing were analyzed and it was determined that consideration of their psychological and pedagogical aspects is an urgent problem. Educational content is the most important element of the educational system. According to the theory of A.E. Bakhmutsky, it is necessary to change the content of education in accordance with the development of society at a time when society is rapidly developing ; said that [49]. According to pedagogue and scientist A.V. Khutorsky, the results of learning the content of education are determined by the way in which students use the acquired knowledge in practice [171, 172, 173].

Currently, it is required that students create a method that meets the requirements of the

time. Both the subject and the object of the educational process are students. For him, the individual psychological characteristics of each student are taken into account [71]. Sometimes, in order for teachers to actively master the curriculum of students, different methods and exercises should be adapted to their temperament.

L.S.Vygotsky [55], P.Ya.Galperin [56, 57], A.A.Leontev [94] show that personal qualities of a person are intensively formed in psychological and pedagogical science. The following cognitive processes respond to positive and negative outcomes of educational processes. The development of the student's thinking is also evident in his speech. P.Ya.Galperin [56, 57] and N.I.Jinkin [69] were engaged in speech direction. A student's speech is formed in the process of thinking, and thinking develops when he communicates with people around him through speech. So, speech is a form of thinking and development of competences related to science determines the content and quality of the educational system. Various activities are conducted with students in education.

Competence is manifested in achieving effective application of acquired knowledge, skills and abilities of students in their activities. Therefore, the current educational process cannot be imagined without the competence approach. In order for students to feel the need to consciously analyze, model, and conduct research, in the field of education at the present time, giving knowledge to students based on a competency-based approach gives high results. If the competence approach is focused on the development of a person (student), he can independently organize educational activities.

Thus, when it is called the formation of general competences related to science in technical higher education institutions, the realization of the knowledge formed within the scope of the studied subject of the student is the ability to apply this knowledge in practice.

Competency approach is consistent with the characteristics of developmental education theory:

In order for the student to independently study the interesting aspects that he has not yet learned, he searches for literature, gets acquainted with the news, gets new ideas as

a result of independent study, creates a scientific hypothesis, which develops scientific buds in the student and gradually brings him closer to innovative ideas. Based on the plan of higher education, the student begins to solve problems that require technical problem-solving. If the teacher brings the students closer to problem situations during the problem solving period, the student's consciousness and thinking will develop and cooperation between "student" and "teacher" will begin to emerge [18, 20, 21].

L. Vygotsky thinks as follows: [55] education and development are independent but interdependent processes.

Scientific researchers (L.S. Vygotsky [55], N.A. Menchinskaya [102, 103]) explain that education and development are separate concepts, unrelated processes. So, the educational process leads to the development of development. The main idea is that education precedes progress. A chain of special measures will be necessary for progress, he says. Thus, the debates of scientists were concluded, and it was concluded that education is developing based on specific rules and conditions. Speaking about the developmental practice of education, if the basic concepts of physics are taught in high school, they are developed in higher education institutions, and in the future, students are trained to be masters of their profession [55, 102, 103].

On developmental education, G.V. Repkina [131] for the development of education, it is necessary to create such conditions in which the student strives for the learning process, which creates an environment for the student to change in a positive direction and feels a commitment to his needs. For the student, enriching his knowledge becomes his need, he begins to learn by his own desire that he needs knowledge for the future, not necessarily. In the assessment of developmental processes, various tests are conducted, in particular, tests to see the special preparation of students. Tests are a modern method of psychological analysis and do not require a lot of effort. It is desirable that the physics teacher conducts his own psychological tests. In particular, tests such as "Aspiration in educational activity", "Achieving success", "Who are you?", "What are you like?", "Understand yourself", "Evaluate yourself" are the most priority directions that determine the thoughts of the student. For example, comparison tests. Tests such as "Can you describe the innovations of your scientific ideas?" As a result, the student notices

what changes are happening in him. All mental states of the student will change. For example, it causes a positive change in perception, perception, concentration, memory, impression and thought process [131].

Teaching technologies developed and used by professors and teachers teaching in technical higher education institutions, determination of professional competence for future technical engineers, are a component of the educational system, and create an important initial basis for mastering one's profession, a theoretical basis for high-level implementation of professional activities in the future , helps in the step-by-step formation of practical and motivational training. As a result of the analysis of the given descriptions, it is possible to identify knowledge as a product of research and thinking activities, creative process in various forms in a systematic, interdisciplinary and generalized way. A comparative analysis of education based on the traditional and competence approach is as follows (see Table 1.3).

In recent years, more emphasis has been placed on the development of students' mental thinking in educational work programs, as a result of improving the content of educational materials, enriching them with methodological knowledge, the student seeks to independently learn unknown knowledge, and learns to find solutions to problems in higher educational institutions using developmental techniques.

Along with the study of the student's personality, science teachers should also be aware of the methods of determining the level of formation of competences to use the acquired knowledge, skills, and abilities in their activities. These issues are carried out through psychological-pedagogical diagnosis and fully cover the educational process. It has the following directions [125].

1. Evaluation of educational results.
2. To study the quality of teaching.
3. Planning the next stages of the educational process.
4. Encouraging their achievements in studying and teaching.
5. Optimizing the education and training process.

Accordingly, the tasks of the diagnosis are as follows:

1. To determine the relative development of students.
2. Analysis of the change in the level of development as a result of certain effects.

In the training of highly qualified engineers in technical higher education institutions, great attention should be paid to deep mastering of the basics of the physics course by physics and mathematics teachers, to ensure the consistency of physics and its teaching at different stages of continuous education. In most technical higher education institutions, pedagogues and students cannot fully imagine the extent to which the content of the physics course is reflected.

Table 1.3 Comparative analysis of traditional and competence approach.

T/r	Didactic elements of the educational process	Traditional approach	Competency approach
1.	Objectives	It is aimed at the formation of knowledge, skills and abilities	Competency to develop directed
2.	Educational programs (educational content)	The state implements the standard of education	Vocational-educational programs trajectory of individual actions aimed at mastery
3.	Forms of educational organization	study hours in the auditorium, 40% outside the auditorium	Work in individual and frontal view
4.	Methods of organizing and implementing the pedagogical process	Traditional methods of teaching within the framework of the auditory system	Non-traditional methods focused on individual and competence approach
5.	Teachers activity place in the process	"Advisor", "informant", "evaluator"	"Partner", "consultant", "assistant", "mediator"

6.	learners in the activity process	"Hearer", "receiver", "keeper"	"Partner", "experimenter", "researcher", "constructor-creator", who applies the acquired knowledge in unfamiliar situations
7.	Management structure of the educational institution	The structure is directed to the operation of a technical higher education institution	The structure is aimed at the development of a technical higher education institution
8.	Application of educational development technologies	Educational technologies knowledge, skills and competencies serves to develop	ability to take a creative approach when moving from one situation to another develops.
9.	Monitoring and evaluation of learning outcomes	Knowledge, skills and of qualifications formed to check directed	Professional and personal qualities of a specialist are aimed at determining the level of development

Important principles of didactics in the study of general physics and its sections, theoretical physics and its sections, and physics teaching methodology in technical higher education institutions, and the sequence and consistency of the content and methods of education at different stages of physics teaching, which is taken into account by the competence approach. In other words, the teachers themselves do not know how to fully apply this principle to the competence approach [121].

How can knowledge laws be used in the learning process? For this, it is necessary to follow didactic principles. The methodological basis of these perceived psychological laws is knowledge about the purpose, content, essence, and structure of teaching in a form that does not prevent its use as a constant standard of competence. Therefore, the system of pedagogical principles, which participate as the main rules necessary for organizing and planning the educational process, corresponds to the system of psychological-pedagogical laws of the theory of teaching in higher education.

In justifying the competence approach in education, higher education refers to those in the house of pedagogy and psychology: the goal of training that meets the requirements of the innovative era; objective laws of teaching; specific conditions of the educational process.

In didactics of higher education, there are different approaches to the foundation of teaching principles, which are as follows: bringing educational work closer to scientific work and new innovative projects; ensuring student activity in independent learning activities.

Technical higher education institutions are characterized by situations such as the personal development of engineers, the direction of their interest in their profession, the stagnation of their independent thinking, activity and outlook, and the formation of their need for self-education. For future technical engineers, the process of education in technical higher education institutions is an important period in the development of competencies considered professionally important for the successful implementation of pedagogical activities.

Didactic concepts of Ya. A. Komensky [88] and I. Herbert [58] are important in the theory of education. In the 50s of the 20th century, psychologist and pedagogue B. Skinner [13, 36] puts forward the idea of delivering information divided into parts to students, achieving efficiency in mastering the material based on regular control of this process. This idea is later called "programmed education". Later, depending on the control results, he created branched programs that offer the learner different materials for independent work. D. Dewey's theoretical ideas became the basis of problem-based education. Today, problem-based education involves creating problem situations under the guidance of the teacher and ensuring students' independence and activity in solving them. The task of problem-based education is to stimulate the active learning process, to form and develop students' thinking, research skills [67].

The idea of the "Zone of Proximal Development" put forward by the psychologist L.S. Vygotsky in the 30s of the 20th century is also important. According to him, students learn with the help of teachers and begin to do things that they could not do independently [55].

P. Blum believes that "all future technicians can not only master, but also successfully study" [34]. The optimal abilities of the learner are determined by the result of teaching the learner, its pace, under certain conditions. According to the scientist, 95% of the learners are able to master the entire content of the training course when the restrictions on the duration of the training are removed. From this point of view, a methodology is developed that ensures the successful acquisition of knowledge by learners, the essence of which is as follows: based on a clear definition of the standard of complete acquisition for the entire course, the teacher prepares a list of specific results that should be achieved at the end of the education and corresponding tests. Educational units, that is, integrated sections of educational materials, are shown, the results of their mastery are determined, and further tests are created that do not affect the final grade [34].

It is important to explain the importance of assessment and learning objectives to each learner when assessing mastery levels of each learning course material aimed at total mastery. Intensive development of the abilities of students who master academic subjects in an empty and moderate way is the main content of P. Bloom's concept [34]. His representatives consider the future engineer to be a rare person. Every educational system operating within the humanitarian paradigm develops creatively, supports the freedom and creativity of the future engineer and teacher.

The main activity of the pedagogue in the technical higher education institutions is to direct the available opportunities of the future engineer to his spiritual, physical, and mental development.

Some social institutes are promoting the idea of organizing the educational process outside technical higher education institutions. Psychological factors were analyzed in connection with the intellectual, emotional and motivational field, and the role of motive, purpose, emotions, personal qualities, and reflection in the development of professional training of future technical engineers was presented. Pedagogical factors included theoretical knowledge, education - culture of information consumption, professional training [74].

Future technical engineers Effective use of pedagogical achievements in the development

of professional training is appropriate. Pedagogical age in recent years Various approaches to the practical implementation of research work are noted . In some cases, negative opinions are expressed about the effectiveness of research . In our opinion , in fact, there is a need to develop materials of scientific and methodical description, which serve to illuminate the ways of a competent approach to the implementation of research.

ng future technical engineers in the development of professional training Factors in house q should be taken into account:

1. Model of behavior. shows the future technical engineers' inner state of mind, system of spiritual and moral views in their behavior, behavior and behavior. Therefore, the pattern of behavior is an important factor affecting the professional training of a future technical specialist during the educational process.
2. The future technical engineer engages in communication through action to form self-awareness in the process of professional activity. Without motion, there can be no activity. Therefore, ensuring the effectiveness of the development of professional training of future technicians depends on the action factor.
3. It is inculcated into the mind of a technical engineer based on specially organized communication . Speech communication takes place between the objects of the educational process and the future technical specialist become a factor in the process of developing professional training service is provided .
4. The effectiveness of educational work is determined by the attitude of the teacher and the future technical specialist to their activities.
5. Description of educational content, form, methods and tools .
6. Social factors: humanization and democratization of the educational process, independence, freedom, transparency and equality.
7. Territorial factors: content , wealth, historical place of cultural values of the country where technical engineers live and importance.

The competence of learners based on a standardized approach depends on a number of factors. First, in connection with cultural-historical, socio-economic, social-psychological conditions; secondly, in accordance with the main functions of technical higher education institutions, thirdly, a differentiated approach in which the content,

forms and methods of educational work are selected, taking into account the individuality of the participants in the educational process.

It also provides principles that should be followed in the process of improving the methodology of teaching physics in technical higher education institutions based on the competence approach.

The principle of harmony with nature requires compliance with the following rules [175]:

Study and education of future technicians-engineers' individual characteristics;
based on the motivation and needs of future technical engineers;
ensuring interrelationship of psychological-pedagogical diagnosis, counseling and correction.

Future technical engineers need to develop themselves and become a subject capable of self-transformation. Systematization of the knowledge acquired in psychology, pedagogy, physics, astronomy and informatics sciences that a future technical engineer should acquire in the program of the "Designing of technical engineers" module and deepening them on this basis; justifying the place of innovative technologies in the system of multi-level physics education and providing necessary knowledge to the future technician; to justify the need to improve its purpose, content, methods and tools in physics teaching, as well as the obtained results based on the requirements of the time, technical engineers, to introduce the technician-specialist to the planning of educational work; study of modern approaches to design, modularization and organization of pedagogical activities; substantiating the need to design an innovative - pedagogical environment and arming with methods of improving the process of teaching physics based on an individual approach [60]; the future technician-specialists will be able to design the physics teaching process, implement the project, build knowledge, skills, qualifications and competencies based on the use of promising teaching tools ; to teach forms and methods of analysis, evaluation of the pedagogical project and its results; development of analytical, critical, creative and independent thinking skills and competencies is envisaged.

By improving the methodology of teaching physics in technical higher education institutions based on the competence approach, the professional training of future technical engineers will be developed, their socio-cultural communication skills will be developed, in particular, the functional forms and methods of teaching physics, and their theoretical and practical knowledge in teaching physics will be improved.

1.3. Basic and subject-related competencies to be improved in students in teaching physics in technical higher education institutions

Basic and subject-related competencies, the principles of choosing teaching methods are derived from it. Above, we touched on the opinions of many scientists about competence and their views on it. Competencies, which are intended to be formed and developed in students, differ from each other according to the task and essence. For example, educational competencies should be distinguished from general competencies. Educational competence models the student's future life activities [23].

In the current era, the competence approach assumes that in the framework of education in higher education institutions, students will acquire the necessary knowledge, skills and competences for effective use in their personal, social and professional lives. One can agree with the views of the authors I.S. Sergeev [136, 137] and V.P. Blinova [53] about the possibilities of the competence approach:

in an educational institution with a sense of responsibility and awareness; increase the level of responsibility and independence of students in the educational process. As a result, easing the work of the teacher; aligning students' goals with the main teaching goals set by pedagogues; achieve preparation of students for unpredictable, non-standard situations encountered in life; to ensure the unity of the educational and educational process in practice, to show that the same issues are solved in the classroom and outside the classroom with different methods, and to make students understand that education is useful for everyday life [53].

The principles mentioned above are an integral part of organizing the educational process and help the teacher and the student. In the competency-based approach, the primary focus should be on the outcome of higher education. In this case, attention

is paid to the student's ability to use this information in different situations, not the amount mastered by the student. Our position is confirmed by the research works of K. G. Mitrofanov [27, 108, 109, 110] and O. V. Sokolova [30]. They distinguish four aspects of the implementation of the competence approach in practice: Basic competences (basic competence with a higher description than science, in particular, pedagogical technology and techniques of understanding, receiving and analyzing information in various forms); generalization of skills related to science (formation of generalized skills related to science); practical science skills (orienting the acquired knowledge to practical application); life skills (different spectrum of simple skills used in everyday life).

Thus, the competence approach is an important component of higher education. In particular, it is the basis for the formation and development of science-related competencies in students. Competency approach in technical higher education institutions requires, first of all, the creation of conditions that allow the formation of a person who can accumulate knowledge and use it in their later life, using modern and alternative forms of education . V.V. Kraevskii [24, 91] and A.V. Khutorskoi [33] suggest that educational competence is not simply the collection of unrelated knowledge and skills by students, but their collective acquisition [24, 91 , 33]. Therefore, educational competence is a set of knowledge, skills, skills and competences, work experience, motivation, logical thinking, interests and content orientation necessary for a student to perform personally and socially significant effective activities in an objective existence [24].

Having defined the concept of educational competence, it is necessary to clarify its content in this study. In this regard, if we dwell on the position of A.V. Khutorskoy [33, 24], according to him, competencies can be divided into three levels based on the division of educational content into parts: metasubject (characteristic of all subjects), interdisciplinary (subjects included in a certain cycle or each other related fields of study) and subject-specific (subject-specific) competencies. In this classification, educational competence is determined based on the main goal of general education. Applying the concept of educational competence to the practical and normative components of education provides an opportunity to solve a problem that is relevant for many higher education. This problem consists in the fact that although students can acquire enough theoretical knowledge, they have difficulty in solving specific problems or applying it in problem situations [33, 24].

There is no consensus on the definition of core competencies. Because every country or region has its own traditions, mentality and specific requirements. Competence is a social order that society imposes on its citizens, whose list is determined by the social environment in a particular country or region. Such an agreement cannot always be reached. For example, the analysis of the Swiss and the different competences of the student competence shows that they have a creative orientation. Creative competencies include "extracting useful information from experience", "solving a problem", "opening the relationship between past and present events", "finding new solutions".

Competence is a combination of knowledge, skills, abilities and personal characteristics, personal results, systematic activity. This requires the educational system to be based on a competency-based approach. Competent li k and shows the reciprocal ratio of competence , then "competence" is primary, It is clear that "competent li k" is secondary (Fig. 1.3). Given a x loci according to studies, a person 's competence in one or another field is formed, a person is considered competent on the basis of competence and interference of competences (Fig. 1.4).

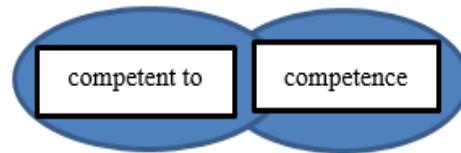
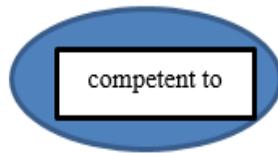


Figure 3. Connection of the concepts of competence and competence in traditional education

Figure 4. The concepts of competence and competence interference

In order to ensure the comparison of competencies with traditional educational parameters, we open the concept of "educational competencies" through the list of components of the structure of the competency: the name of the competency; type of competence and its place in the general sequence (basic, general sciences, related to science); the range of objects, where competences are introduced, and which perform real activity; socio-practical relevance and importance of competence; the importance of competence to the individual (why should a student be competent?); knowledge of the scope of real objects; skills and competencies related to the scope of given real objects; indicators of the minimum experience required for the activity of a student within the scope of this competence - training and control to determine the level of

student competence - samples, examples of assessment assignments. The given set defines a set of normative documents, teaching-methodical literature, as well as a descriptive set for determining the general readiness of students, as well as designing and covering documents that evaluate the level of their creative readiness. Ensuring the implementation of the decision of the First President of the Republic of Uzbekistan No. PQ-2487 of February 9, 2016 and the implementation of the decision of the Cabinet of Ministers No. 187 of April 6, 2017 "On approval of state education standards of vocational education and higher education institutions" during 2017-2018 stage was put into practice [8].

The following basic competencies are formed in the model curricula of higher education to provide students with knowledge based on contemporary students: communicative competence; information processing competence; self-development competence; socially active civic competence; national and universal competence; physical literacy competence to be aware of science and technology news; competence to inculcate innovative ideas in students; general competence in physics is threefold: observing, understanding and explaining physical processes and phenomena, conducting experiments, measuring physical quantities and drawing conclusions; practical use of physical knowledge and tools, competence, development of the ability to be aware of and use scientific and technical innovations that ease human labor, increase labor productivity, and lead to favorable conditions [39].

To be able to interpret the principle and priority direction of development reform, to be able to tell about the place of our country in the world community and the period of development, to be able to read and use various formulas, models, drawings, graphs and diagrams in daily activities. After that, these basic competencies are embedded in the training of academic subjects. Based on the curriculum, it is absorbed as follows (see table 1.4).

The goal of the development of the DTS and the curriculum based on the competence approach of the subjects is to adapt the level of knowledge of students to today's requirements, to raise them to the level of international standards, that is, to direct them to the formation of the competencies of practical application of their acquired knowledge, skills and abilities in their personal, professional and social-practical activities.

The level of demand for physics today: the development of technology, the role of science in the field of production and everyday life, the scientific outlook of students, the ability to think logically, mental development, the formation and growth of the potential for self-awareness, their education and professional activity. formation of the necessary competencies during the course is determined by the ability to apply the knowledge acquired today tomorrow.

In technical higher education institutions, it is important to first increase their educational motivation for training in the chapter "Fundamentals of molecular physics and thermodynamics" when conveying the liquid and its properties to students. One of the main requirements for education today is the need for students to be able to apply the knowledge they have acquired in life. Competences related to basic and physical science were conditionally selected in the teaching of science.

Table 1.4 Curriculum-based competencies

Communicative competence	Reflecting the communicative competences that need to be formed in the subject.
<ol style="list-style-type: none"> 1. Based on the topic, being able to ask and answer questions logically, knowing the mother tongue and one of the foreign languages 2. Adhere to the culture of communication in interaction, be able to work in team cooperation, analyze the interlocutor's opinion and defend one's position. 	<ol style="list-style-type: none"> 1. To know physical concepts, for example: quantity of matter, specific heat capacity, to know the names of physical terms in other languages and to use them in communication. 2. The law (gas laws, reflection of light, refraction) rules - to be able to clearly explain the definitions (isothermal, isobaric, isochoric) orally and in writing.

<p>3. Being able to manage one's passion in various conflict situations, react to disagreements with a fair, just and positive approach and make the necessary decisions</p>	<p>3. Being able to logically ask and answer questions based on their knowledge of the relevance of subject concepts to science.</p> <p>4. To respect the interlocutor's opinion on the topic, to be able to work on the basis of mutual agreement.</p> <p>5. When solving problems, making decisions based on physical phenomena and laws presented in various tasks</p>
<p>Competence to work with information</p> <p>1. Being able to send and use available information sources (Internet, television, radio, audio, video recordings), phone, computer, e-mail.</p> <p>2. Creating a database in EXSEL, analyzing them.</p>	<p>Reflection of the competence to work with information, which should be formed, in the academic subject</p> <p>1. Ability to work with various sources of information: books, dictionaries, popular scientific literature, newspapers and magazines, Internet, electronic development, electronic textbooks, television, radio, computer, e-mails.</p> <p>2. Finding the necessary information on each topic. To be able to write a course work and report on the given topic.</p>

<p>Competence of self-development as a person</p> <ol style="list-style-type: none"> 1. Self-development as a person . 2. To feel the responsibility of working in groups, to be a leader , to make decisions in various problem situations . Pursuit of physical, spiritual, spiritual and intellectual perfection . 4. To be able to demonstrate one's ability according to one's interest, to participate in science Olympiads and competitions. 5. To have human qualities such as honesty and truthfulness. 	<p>The reflection of the competence of self-development as a person to be formed in the educational subject .</p> <ol style="list-style-type: none"> 1. Preparation of an abstract and a course work on the works and topics of scientists who independently contributed to the science for the purpose of self-development in the study of this science as a person. 2. To be able to independently perform laboratory works, experiments and draw conclusions. 3. In order to show interest in science based on what they have learned, to make technical creativity related to science, to try to create new technical projects 4. Participation in various activities, gaining respect and being able to solve problems encountered in everyday life.
<p>Socially active civic competence</p> <ol style="list-style-type: none"> 1. Feeling responsible for the country. 2. Not to be indifferent to the happenings in society, to express one's attitude. 	<p>The reflection of socially active citizenship competence that should be formed in the academic subject.</p> <ol style="list-style-type: none"> 1. Technology should feel its place in higher education institutions, neighborhoods and public places and create innovative ideas and implement ideas for living. To be able to objectively evaluate the advantages of one's subject references, independent work .

<p>3. Understand the essence of his profession and consciously strive for the future. Compliance with labor and civil relations, economic, ecological, legal culture.</p>	<p>3. To help comrades in technical higher education institutions , to participate in discussions with them, to be generous to those who need help.</p>
<p>Universal competence</p> <p>1. Careful preservation of the historical and spiritual heritage of our people , respect for rituals and traditions .</p> <p>2. National ideology, national general - knowledge of human principles and tasks.</p>	<p>The reflection of the necessary general human competence in the educational subject.</p> <p>1. To be loyal to the Motherland by being kind to people.</p> <p>2. Show creative ability, create different layouts, puzzles, new innovations.</p> <p>3. To study the place of physics science among other sciences, its history and ways of development.</p> <p>4. Respecting the world view of others</p>
<p>Mathematical literacy, awareness of science and technology news and competence in use</p> <p>1. To be aware of and be able to use scientific and technical innovations that lighten human labor, increase labor productivity and lead to favorable conditions.</p> <p>2. To be able to interpret development reform, five principles and seven priorities, to have information about the place of our country in the world community.</p>	<p>Mathematical literacy that needs to be formed, to be aware of science and technology innovations, and to reflect the competence of use in academic subjects.</p> <p>1. Being able to show the results of one's activities based on accurate calculations</p> <p>2. Being able to draw drawings, graphs and pictures using formulas in daily activities.</p> <p>3. Ability to work with various measuring equipment.</p> <p>4. To be aware of the news in the development of science.</p>

It is necessary to develop these competencies in each lesson, and as its effective factors: the teacher's creative approach to each lesson; it is possible to mention the need to increase the competence of the science teacher and the motivation of students to study (interest, desire, desire, devotion) [79].

One of these factors is the motivation of students to study. Today's student in the information age differs sharply from yesterday's in terms of his demands, outlook, and high need for innovation. After all, this period requires the necessary modern requirements, i.e. competitiveness in all fields. A competitive and perfect human education is the requirements of DTS imposed by the state. Competency approach to education is implemented by arousing students' interest, desire, i.e., motivation to study in one or another subject.

We will try to motivate students by creating a problem situation related to the topic "Liquids and its properties" in physics.

1. In which glass is the saltier water?
2. Ice, especially snowflakes, refract light rays very strongly. What happens in nature if light is refracted less? (Figure 1.5)

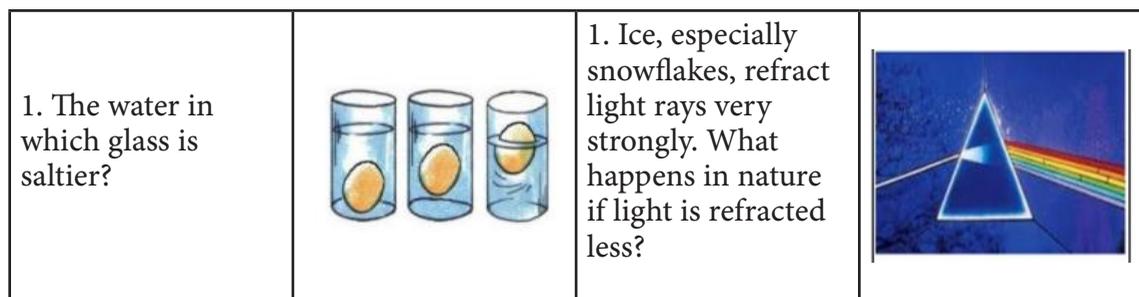


Figure 1.5. Comment on the given pictures.

1. Formation and development of communicative competence.
In the topic "Liquid and its properties", students will be able to express their thoughts clearly and clearly by listening and speaking, the main properties of liquids, physical and chemical properties, the importance of water in nature and the human body, by writing their chemical formulas, their written speech will be formed. to know the relevance, to know the names of the physical terms related to the subject in

other languages, and to have a firm opinion based on one's own knowledge, while respecting the opinion of others, in various problem situations, relying on one's own knowledge, skills and qualifications, on the basis of each physical phenomenon, concept and laws this competence is formed in the student by being able to make a decision.

2. Formation and development of competence in working with information.

When studying the topic "Liquid and its properties", this competence is formed by finding sources of liquid, choosing and effectively using it, analyzing the properties of liquid, in particular, the importance of water in human life, and its use in everyday life. For example, "There is no mysterious liquid like water in nature. It has the following unique features: 79% of the earth's surface is covered by water. Due to the high heat capacity, water absorbs most of the heat energy coming from the sun and prevents overheating" and students are given the task of remembering and searching for new information (see Table 1.5).

Table 1.5 Content of the question

Content of the question	The answer
Is it possible to make fire using ice?	Yes, make a lens out of ice
What percentage of the human body and bones consists of water?	In the body - up to 71%, in the bones up to 22% of water.
Why does a small piece of iron sink in the water, but a huge ship can float on the surface of the water?	Remember Archimedes' law, the shape and size of the ship

3. Formation and development of self-development competence.

In order to strengthen the topic "Liquid and its properties", the ratio of water and land areas on the earth, salt and fresh water basins, the formation of rain and snow, understanding the amount of liquid in the human body and the process of its exchange, base the proportions of drinking liquid (water) in winter and summer. receiving, relying on the knowledge and experience learned during his life about the importance of fluids in following a healthy lifestyle, the skills of an independent intellectual approach to problem solving are formed.

4. Formation and development of socially active civic competence.
A sense of involvement in global problems related to our country and other countries (for example, involvement in solutions to the problems that cause a shortage of drinking water and car fuel, avoiding excess water waste, using the heating system, having a good study of liquid and its properties, service for the interests of society and family this competence is formed and developed by instilling in the minds of students.
5. Formation and development of national and general cultural competence.
For example, in strengthening the theme "Liquid and its properties", the spring water is at the same temperature in winter and summer, its composition, the feeding of fish from dissolved minerals in the spring, in particular, the rich heritage "Chashma" left by our ancestors in the city of "Nur-ota". teaching to carefully preserve the ry complex.

Formation of general competences in physics in students can be done as follows. Observing, understanding and explaining physical processes and phenomena, the topic "Liquid and its properties" will be explained in the audience through simple examples, i.e. fluidity of liquid, full occupation of volume, preservation of crystalline form, phenomenon of evaporation and condensation. The student uses the knowledge, skills, and abilities he has acquired about fluid properties in everyday life, understands and explains the process. In particular, he understands and explains his opinion on the aggregate state of water, maintaining the balance on earth and its importance for the human body, solubility properties of liquid, the process of using liquids in technology (see Table 1.6). In addition, the student observes, understands and explains the process of the change of seasons in nature , the formation of snow and rain. In this, the student can clearly and clearly express his opinion orally and in writing, based on the topic, can ask questions logically, and can work in team cooperation, following the culture of interaction in communication. By observing this process, students study throughout their life, regularly increase their knowledge and experience independently, and this competence is formed [83].

Table 1.6 The content of the questions

1. Is it easier to swim in fresh water or in salt water? Why?	Swimming in salt water is easy. Because the density of salt water is greater than the density of normal water.
2. If we drop a watermelon first into a tub filled with fresh water, then into a tub filled with salt water, what will be the ratio of the masses of water that overflow from them?	The volume of the overflowing water is different, not the mass.
3. Which keeps heat better: fresh water or salt water?	Clean water.

2. Conducting experiments and drawing conclusions

The purpose of the experiment is to be able to choose, collect and use tools for the experiment. For example, when passing the topic "Liquids and its properties", students will be given knowledge about liquid volume, density, mass, heat capacity, formula, units and how to measure them. Problems are given in order to strengthen the topic, to be able to measure, determine and apply physical quantities in practice [22].

Including the evaporation and boiling temperatures of water, the amounts of hot and cold water when filling a bathtub for bathing, the relative humidity of the air in mm. sim. above When announcing the effect of relative humidity on breathing, the student draws a conclusion based on the knowledge, skills and abilities acquired in the audience. He can measure the necessary physical quantities using scales, thermometers, psychrometers, calorimeters (Fig. 1.6).



Figure 1.6. Conducting experiments, measuring physical quantities and drawing conclusions.

3. Ability to use physical tools in practice.

In the topic "Liquid and its properties", knowledge is provided about the fact that the temperature of a liquid is a physical quantity that determines the thermal state of a substance, its unit, their scales, and how the temperature is measured with the help of instruments. At the end of the topic, a practical task will be given information about the role and importance of liquids in the operation of excavators and cranes, heating of buildings. This competence is formed through the knowledge of thermometer, barometer, manometer scales, measurement quantities and their types, as well as the practical application of physical knowledge (Figure 1.7).



Figure 1.7. Ability to use physical tools in practice.

A lesson in the formation of basic competencies for students requirements for training . The competency-based approach requires an increased practical description of higher education as a whole. In this case, the teacher also has to change his work . The main task should be to teach the requirements to increase knowledge independently, to show initiative, to form the skills of living in a team and studying. In today's rapidly developing era, society needs educated, ethical, news-savvy people. He must have the following qualities: be able to analyze his actions; it is necessary to be able to analyze the consequences of all actions, to be able to make independent decisions; fast operation; ability to work cooperatively; it is necessary to cultivate a sense of responsibility for the fate of the country, its socio-economic prosperity [31].

In the requirement of the standard based on the competence approach, it is necessary to increase students' interest in studying the environment, to search for useful information, and to strengthen their readiness to apply it in life. Accordingly, the activities of the teacher and student during the preparation and conduct of modern lessons will change. It is known that lecture is the most common type of training in higher education, let's

find out the nature of its changes from the point of view of modern students (see Table 1.7).

The teacher should pay attention to the following in order to prepare a modern type of lesson. Determining goals and objectives. Extracting the content of educational materials. Choosing a teaching method. Determination of control methods.

Table 1.7 Didactic-methodical, applied to lecture classes requirements.

Didactic requirements for the lecture	Traditional lecture training i	Modern lecture training
Announcing the content of the lecture	Said by the teacher	Formed by students
Tell the goal tasks	What students learn is shaped and told by the teacher	Students participate in activities with an understanding of what they know and what they do not know
Planning	tells the students what they need to do to achieve the goal	of achieving the intended goal are planned by students
Practical activity of students	It is performed by students under the guidance of the teacher	Students carry out educational activities based on the established plan
Implementation of control	Supervises the practical work done by the teacher and students	Students monitor (self- and peer-monitored)
Student assessment	The teacher evaluates the students in the audience	The student evaluates the performance of himself and other students
Concluding the lecture	The teacher asks the students what they remember	On the basis of mutual questions and answers

Didactic requirements for classroom and non-auditory classes:

training in an equipped science room; should determine the subject of the training, goals and tasks, and plan the student's activities; the training is challenging and developmental, and the teacher and student should work together; activates the student's activity by organizing problematic and interesting situations; accustoming the student to draw conclusions.

When choosing educational technologies for the formation and development of basic competencies in students, the teacher of educational science determines the basic competencies for the calendar-subject. If the student heard and understood it during the training, it is good. What if it wasn't? If a student takes lectures and labs in an inactive state, he cannot develop. Personal action can be the basis for the formation of the student's independence in the future [80]. Therefore, it is necessary to create the conditions for the realization of the educational task of the student. In this, the student forms learning activities with the help of the teacher. They organize the laws and definitions themselves and come up with different definitions. The teacher should support these ideas and synchronize his ideas with the student's ideas. A student should be able to draw a graph of the text he has read, solve problems based on certain rules, and explain to his friends. If the student is intellectually capable, takes a bold step forward in new conditions, he will be able to achieve his goal.

If in the process of training future technical specialists, they can develop the ability to overcome the above problematic situations, the following results will be achieved: future technical specialists will enter into personal economic and professional relationships and take their place in society during their future life; solving problems encountered in processes; to be competitive in the field and to create innovative ideas; as a result, the student acquires basic competences, thus being able to work together with communicative information; self-development as a person, mathematical literacy, being aware of science and technology innovations are included. In the educational process, in order to achieve the goal of teaching based on the competence approach, it is appropriate to enrich the educational content based on innovative technologies [77]. Competence formation is important for human life. Basic competences affecting general development, specific competences are determined by in-depth study of physical science. Competence in the

study of physics develops the ability to apply the acquired knowledge, skills and abilities in practical and creative work necessary for everyday life, interest in technical creativity. In order to interest the students of the technical specialty, independent work and excursions are organized during the training. It is important to introduce innovations in education to adapt the activities of technical higher education institutions to modern changes in order to achieve the goal of developing students' competence.

Communicative competence in technical higher education institutions: improving oral and written speech; be able to write written and oral answers to structured questions; able to express one's opinion clearly and clearly; be able to work with additional literature and create tests and questions using them; able to work in groups, defend one's opinion, persuade; ability to manage oneself in solving problems, in addition to the mother tongue, foreign languages should also be changed.

To form and develop communicative competence:

Regular work with the textbook; the ability to work on the text; find answers to questions using the topic; ability to perform practical tasks; it is necessary to be able to construct an electric circuit and a graph using the subject materials.

In order to develop the competence of self-development of future technicians as individuals, focusing on independent work education, creating a set of educational and test tasks, using educational and video films on the topic, sorting information from additional literature and websites, and preparing independent work, lecture and presentation materials in general intellectual maturity is required. [38].

Physics lessons, excursions and independent work play an important role in the formation of socially active and civic competence. It is necessary to learn to be friendly with people, to contribute to the development of the country, to work for the future of the country, and to learn about the events and events that happen in society.

It is known that knowledge acquired in secondary education and secondary special education is developed in higher education. Therefore, the formed competences are also developed in turn. On the basis of the decision of the Cabinet of Ministers of the Republic

of Uzbekistan dated April 6, 2017 No. 187 "On the approval of the state educational standards of vocational education and higher education institutions", in order to ensure the continuity of educational content, educational material and competences formed in continuous education, based on the requirements established in the state educational standards the following competencies are formed and developed in technical higher education institutions.

1. Competence to observe and understand physical phenomena.

Able to observe physical processes and phenomena, know and describe basic concepts of their nature; he knows basic concepts, terms, physical quantities and their units, laws, and connection formulas related to mechanical, heat, electricity, light, sound phenomena and simple mechanisms and can use them to solve problems. Can consciously observe physical processes and events, can explain their essence; knows the concepts, terms, physical quantities and their units, laws, connection formulas of physical phenomena, can apply them in practice and use them in everyday life.

Can use relevant physical quantities in summarizing and describing the results of observation, and can write and explain their interrelation in the form of mathematical expressions; knows and can use in practice concepts, terms, physical quantities and their units, laws, bond formulas related to the basics of mechanics, molecular physics and thermodynamics, electricity, optics, atomic and nuclear physics, and can use them in everyday life.

Summarizing the results of observation, he can write their interrelation in the form of mathematical expressions and draw conclusions; can solve practical and problematic issues based on physical laws and their connection formulas. Understands and explains the International System of Units (SI) of physical and astronomical quantities, mathematical expressions in a logical connection; knows extended basic concepts, terms, physical quantities and their units, laws, bond formulas related to the basics of mechanics, molecular physics and thermodynamics, electrodynamics, vibrations and waves, optics, atomic and nuclear physics, and can apply them in practice. Able to apply extended basic concepts, terms, physical quantities and their units, laws in educational areas [145].

2. Competence to conduct experiments, draw conclusions.

Students perform practical tasks, measure relevant physical quantities, write their results in tabular form and draw conclusions; a physicist knows the concepts and units of quantities and can connect this quantity with other quantities through formulas. Can conduct experiments, measure relevant physical quantities, summarize results, draw conclusions; the physicist knows how to bring quantities into the same system, can connect and explain quantities through formulas. Conducts laboratory experiments, describes the results in tables and graphs, can draw conclusions; knows how to bring physical quantities into the same system; can calculate errors in measuring physical quantities. He can measure directly determined quantities with the help of physical instruments and can calculate indirectly determined physical quantities and errors in their measurement [79].

Can conduct experiments independently and compare the obtained results, can describe the results in table and graphic form, can draw appropriate conclusions; knows the methods of determining physical quantities. Independently collects experimental devices, can conduct experiments and compare and analyze the obtained results; can describe the results in tabular and graphical form and draw appropriate conclusions; knows the methods of determining physical quantities. Can compare directly measured and indirectly calculated values of physical quantities, can identify measurement and calculation errors; knows the principle of operation of instruments measuring physical quantities; can demonstrate research characteristics [148].

3. Competence to use physical tools in practice.

Can solve simple problems using physical concepts, rules, laws and formulas; can use measuring devices and equipment (stopwatch, barbell ring, scale, beaker, dynamometer, thermometer, barometer, manometer, etc.), observes technical safety rules while working with physical devices . Can solve problems related to physical phenomena; can use physical measurement tools in practice and everyday life. Can solve practical and qualitative problems using physical laws and formulas; can use measuring devices and equipment (psychrometer, electrometer, ammeter, voltmeter, ohmmeter, microphone, magnifying glass, glasses, etc.), observes technical safety rules while working with physical devices. Can use physical laws, measuring instruments and equipment in

practice, technique and life activities; can estimate the measurement error of physics instruments. He knows how to apply the theoretical foundations of physics to everyday life and professional areas [147];

Can solve simple problems related to science; measuring instruments, equipment and educational tools (electronic scale, aneroid barometer, luxmeter, Geiger counter, tribometer, calorimeter, Whitson bridge, sound generator, Thomson coil, spectroscope, diffraction grating, laser device, light sources, photodiode, photorelay, photoresistors, computer, video projector, etc.), can evaluate the measurement error of the tools, observes the rules of technical safety in the process of working with physical tools [128]. can apply the theoretical foundations of physics to everyday life and professional areas; can solve moderate science problems. Measuring instruments, equipment and educational tools (electronic scale, aneroid-barometer, luxmeter, Geiger counter, tribometer, calorimeter, Whitson bridge, sound generator, Thomson coil, spectroscope, diffraction grating, laser device, light sources, photodiode, photorelay, photoresistors, can use a computer, video projector, etc.), can evaluate the measurement limits and errors of devices, can explain the principle of operation of physical devices, observes technical safety rules while working with physical devices. Developed on the basis of a competency-based approach and developed into the national education system, these SDS cannot be implemented by a single decision or order. For this, all participants in the education system must work together in harmony. First of all, it is necessary to solve the following main problems in the educational process:

setting training requirements based on a competency approach;

development of teacher's professional competence;

improvement of textbooks based on the competence approach;

selection and application of educational technologies for formation and development of competencies in students;

determining and evaluating the formation of competencies in students;

ensuring the compatibility and harmony of the formation of basic and physical competences.

Along with the development of competence in physics, basic competences are formed. They are not formed separately from each other. From this, along with the formation

of competencies related to each general education subject, basic competencies are formed in students, that is, the competencies related to the subject serve to develop basic competencies. The methodical solution of these issues creates the need to develop a model that connects them, that is, the development of competencies in students [151]. Below are the skills that allow you to implement in the process of developing competences related to physics:

The ability to predict (based on his own experience, he can tell how the studied process will proceed. For example, the change in pressure and volume due to an increase in temperature using the equation of state of an ideal gas); ability to set a goal (result achieved in the process of studying science. For example, studying the ability of objects to carry heavy loads by studying Archimedes' law); analytical skills (it is with the help of this skill that students have the opportunity to think, that is, to find and isolate the main idea, to consciously accept the studied material. For example, why does salt or sugar not overflow in a container full of water); interpretation skills (to understand and explain the relationship between the physical parameters related to the studied process. For example, the increase in the power of the car engine leads to an increase in its traction force or speed); assessment skills (the ability to assess the extent to which the student can apply the studied natural law in practice, in order to determine the effectiveness of the device working on its basis). The active phase includes science-related skills. This means receiving and re-reflecting the received information and working with different sources) [52].

The last step in the development of physics-related competences is the evaluation of results. This stage consists of checking the appropriateness of the obtained result, i.e. to determine the degree to which the students' competences related to science have been formed and the achievement of the set goal. The result of the formation of competences related to science is checked based on the methodology used to determine the initial competence of students. The stage of evaluation of the results allows to assess the level of competences related to the subject. Its formation is judged by certain standards.

Conclusions on chapter I

1. In education based on the competence approach, the student becomes the main

participant in the educational process with personal goals and tasks. This approach allows students to engage in active, conscious activities, develop informational, communicative, educational and cognitive skills, personal potential, form self-esteem, develop self-management skills. It was determined that appropriate use can serve to develop the educational process.

2. The issue of developing the educational and scientific training of future technical engineers is an urgent scientific research and problem, the study of its scientific-theoretical and practical foundations, the analysis of the competence approach, the implementation of the theoretical ideas advanced on the basis of conclusions and recommendations, and the basis of the training of technical engineers in accordance with the requirements of the time. it was scientifically proven.
3. Ensuring the efficiency of education based on the competence approach is a competitive, all-round training of intellectual personnel, proportionality to the implementation of legislation in the field of education, decrees and decisions of the President of the Republic of Uzbekistan, and its application in practice found its basis in the research work.
4. Knowing the essence of the scientific-practical views of mature pedagogues, physicists, technologists of our country and abroad on the development of theoretical training of future technical engineers in terms of the time and society's demand and following it was considered the ideological foundation of training future technical engineers.
5. The development of professional training of future technical engineers, students based on the requirements of the state and society, is reflected in the regulatory and legal documents of the government, the need to follow it, the problems of organizing a competent approach, the methodological and general pedagogical aspects of the scientific-pedagogical research object and science are not sufficiently studied. the theoretical basis of the competence approach was created and put into practice.
6. Development of training of future technical specialists based on the competence approach, educational programs for teaching physics in technical higher education institutions, work training programs, educational-methodical complexes, the methodology for developing basic competencies in the training of technical engineers based on competence were developed and put into practice.



UNIT | 2

THE DIDACTIC SYSTEM OF PHYSICS TEACHING IN TECHNICAL HIGHER EDUCATION INSTITUTIONS BASED ON THE COMPETENT APPROACH

2.1. Application of pedagogical technologies in improving physics teaching based on the competence approach

The changes taking place in the higher education system of our country require research, innovations, and changes in the field of physics education as well. The issue of raising a well-educated, well-rounded person requires pedagogues to implement new principles of work, the basis of the basic competence approach, and at the same time imposes a great responsibility. The methodical system of teaching physics taught in technical higher education institutions means the structure including the purpose, content, methods, forms and means of training, as well as training projects. The methodical system of teaching physics is subject to its own rules and laws, the internal structure of the system, its elements are closely related to each other and external relations, and the basis of the competence approach, which guarantees the quality of education, represents a complex, dynamic set of education [70].

V.P. Bepalko defines the concept of methodical system of teaching as follows: "Pedagogical system is a set of interconnected methods, tools and processes required to have a specific goal, organized, pedagogical effect on the formation of a person with certain qualities. So, the priority values of the society determine the requirements and goals of the formation of the personality, based on this, the pedagogical system also changes" [51]. Therefore, all communication between education and the teacher, which represents the pedagogical process aimed at the development of the individual, is carried out within the framework of the above-mentioned structure [71].

The development factors of the educational process in all periods are reflected in the changes in the characteristics of the elements of the pedagogical system, their interdependence and structure. It is important to note that in the structure of the

pedagogical system, the two basic concepts of any scientific theory are clearly visible: the task and the implementation technology. The structure of the didactic task reflects the goal conditioned by information about the conditions and status of a person, as in any activity. The didactic goal is the formation of certain qualities of the person, the conditions are determined by the personal qualities of the learner in the initial state, and the information is determined by the content of the subject.

The main task in creating a methodical system of teaching physics is to create its methodical model, and its elements are reflected in Table 9 (Fig. 2.1).

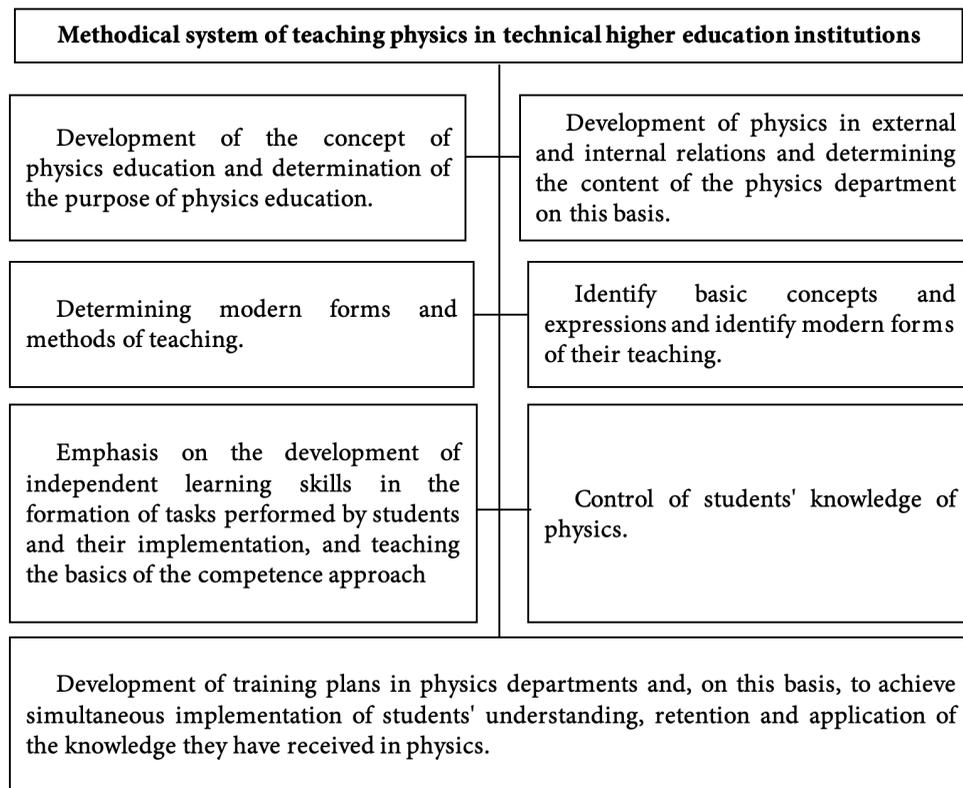


Figure 2.1

Technical higher education institutions, the teaching goals, which are the main element of the teaching methodology system of physics and its department, must be aimed at serving the development of society. Fundamentals of the competence approach in technical higher education institutions, different innovative approaches are taken

into account when creating a methodical system of teaching each taught department of physics. For example, in the creation of this methodical system, in contrast to the methodical system of traditional teaching, lesson plans of physics taught in technical higher education institutions participate as the main element of the methodical system. Based on this, in determining the purpose of teaching physics taught in technical higher education institutions, it should be determined based on the general culture of society, the formation and development of students' knowledge, skills, qualifications, competence, the development of skills, and the formation of a person with intellectual potential, and it should be determined based on the social order or need of society. The goal is a product of achieving a predetermined result, which is a guarantee of the planned competence approach at the end of the joint activity of its subjects (teacher and student) in the educational process [19].

In the 21st century, which is the age of "intellectual knowledge", physics is progressing day by day, various theoretical discoveries are being made in it, as well as the field of practical applications is expanding. Physics as an academic subject is required to be taught and mastered by every member of society.

After all, physics as a science requires a full and deep study and promotion of the laws that reflect the spatial and quantitative relations of material existence; does not consider the content of the laws being studied, the method they are based on, and the level of development; it does not matter the personal qualities of the researcher, how this or that law of physics was discovered; the science of physics is created and developed in a certain system, which reveals strictly sequential laws that depend on each other. In this case, the basic concepts and accepted rules of physical science serve as the initial basis for it [128].

Physics as an educational subject serves to ensure the following: Students are given physical knowledge, skills and abilities; directions of students are taken into account when giving physical knowledge; the approach to the introduction of a new physical concept or law is important, and the method of its description is chosen on this basis; abstract concepts are revealed through explanations and examples; repetition is also carried out in teaching; it is impossible to reduce and destroy the educational science system, otherwise it is necessary to pay attention to deepening it.

It is important that teaching materials for physics, professional training of physics teachers, specialists in the field of education and training plans be adapted to the conditions of modernization, and proper development of methods of accurate and objective evaluation of educational results. In general, at every stage of education in the current environment, "what can be taught and what should be done to achieve it?" and "who should be trained? What exactly should he be taught? (exactly in each specialty), why should it be taught (goal), how should it be taught (method, form, tool, technology)?" the issue of effective resolution of such issues is one of the important problems [134].

Nowadays, "what should be taught?" rather than "what can be taught and how should it be done?" It is important to approach the organization of the educational process and modernize the teaching of physics in technical higher education institutions.

In technical higher education institutions are based on the following: the selection and formation of the educational content and the rules, principles and methods of didactics in its improvement. Based on this, it is appropriate to divide the hours allocated to physics subjects taught in technical higher education institutions as follows (see table 2.1).

Table 2.1 Hours allocated to subjects in technical higher education institutions

T/r	Topics	Lecture hour	Practical hour	Laboratory clock	The problem	Problem solution
1.	Mechanics	14	8	10	Lack of training hours, lack of equipment	If an optimized textbook is developed, problem sets and lab sets are discovered
2.	Molecular physics	6	4	2		
3.	Electrostatics	6	2	2		
4.	Constant current	6	2	4		
5.	Electromagnet	8	4	4		
6.	Vibration, waves	4	4	-		
7.	Optics	8	4	8		
8.	Atomic structure	6	2			
9.	A modern view of the world	2	-	-		

In the preparation of physics curricula taught in technical higher education institutions, didactic requirements, rules of composition, principles of composition and factors of development of students' intellect and expansion of thinking; taking into account that physical science is the basis of understanding the world, to reveal the laws of occurrence of surrounding phenomena, to develop production, science and technology, and technology; to increase attention to manifestation and activation of students' independent thinking skills; the development of practical skills leading to effective work by positively solving the problems faced by students in their various activities was achieved.

The purpose of teaching physics in technical higher education institutions is to educate a person who has developed knowledge, skills, competence and intellectual potential. The goal is a product of achieving a predetermined result, and at the end of the joint activity of its subjects (teacher and student) in the educational process, high efficiency is achieved (Figure 2.2).

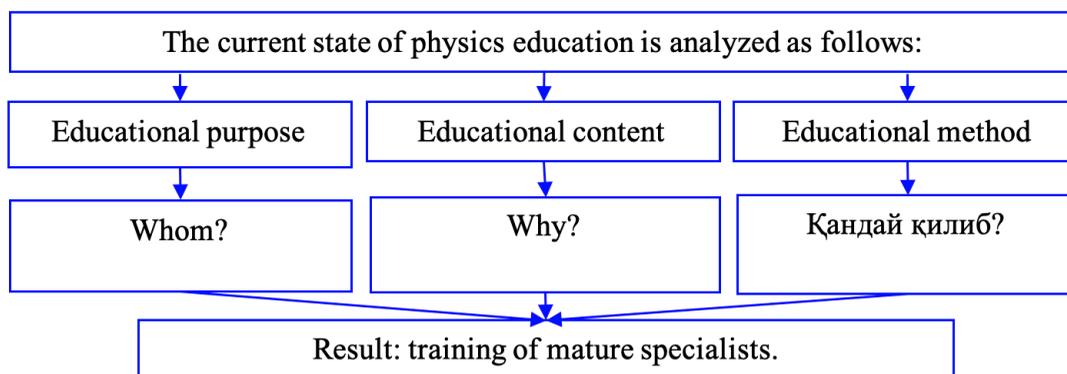


Figure 2.2. The current state of teaching physics based on the competence approach in technical higher education institutions.

According to their essence, the issues can be divided into two types. These are creative and non-creative issues. A creative problem encourages the student to think independently, to think logically, and to fully understand the content of the problem. Solving creative problems requires prior acquisition of new knowledge, and interdisciplinary integration is important. In the stages of improving the methodology of teaching physics in technical higher education institutions based on the competence approach, both the functions of

the teacher in the pedagogical activity and the stages of formation and development of basic and science-related competencies in students were considered together (see Table 2.2).

It is recommended to use pedagogical methods divided into three categories, which are used in the organization of the educational process formed on the basis of DTS, based on modern pedagogical technologies, in clarifying the methods of the basis of the competence approach.

Table 2 Stages of improving the methodology of teaching physics in technical higher education institutions based on the competence approach

T/r	Content	Actions to be taken
1.	Forming empirical conclusions and developing scientific competencies through theoretical generalization of physical concepts	conducting pedagogical observations, analyzing the activity of the teacher and student during physics teaching; scientific study of physics teaching tools, methods and forms and design of their application methodology; formation of initial experiences of planning and applying methods of physics teaching process; systematization of physics course materials and their assimilation by students; familiarization of students with equipment, formation of skills for conducting experiments; students' demonstration and application of knowledge in familiar and unfamiliar situations during practical training.
2.	Development of the competence to generalize theoretical knowledge and apply it to practice with practical work	students' ability to generalize knowledge of physics (general questions, formation of physical laws and concepts, specific questions); development of students' research ability in conducting simple pedagogical research; to teach students to conduct physics experiments and identify and use malfunctions, solve problems.

3.	Develop advanced empirical inference, understanding of patterns, and foundational and scientific competencies	Studying modern technologies of physics teaching based on the competence approach and developing the principles of their application; students study the necessary normative documents and their importance in practice during the study of physics; the ability of students to conduct physical experiments in the course of teaching physics and to use it in practice and to use different methods of solving problems; students create startups and innovative projects while studying physics and use them in everyday life.
----	---	--

The methods of the first category are called "Traditional methods", with the help of which imparting knowledge to students is based on the principle of "Delivery". They include: informative-receptive or illustrative-explanatory; reproductive; problematic statement; heuristic or semi-research and research, "tell", "show", "demonstrate", "lecture presentation", "question-and-answer", "discussion", etc.

of the second category are called non-traditional or "Interactive methods" and rely on the principle of "Activation" in students' learning. These include Accelerated Teaching Method, Problematic Exercise, Small Group Work, Round Table Discussion, Cluster Method, Confrontational Approach, and many other methods.

The methods of the third category are called "Advanced or modern methods" and are based on the principle of the competence approach of "Accelerating and improving the efficiency" of the educational process. They include: "Directed text", "Programming", "Technological map method", "Modular teaching method", "Intellectual map" and "Design method", as well as the "Pedagogical technology" method, which combines the advantages of all methods. Educational goals cannot be achieved without modern educational technologies and their methods for increasing and improving educational efficiency [128]. Forms of organization of teaching physics and its departments taught in technical higher education institutions are determined by the mutual influence of teachers and students in the educational process. Focuses on the educational process of teaching forms (lectures, practical training, seminar, laboratory, etc.) and individual

(independent work, individual consultations, etc.) educational activities. Lectures are the main form of organizing physical education classes in technical higher education institutions, which are the basis of the educational process.

The characteristics of the physics lesson are as follows: 1) educational and educational tasks are solved; 2) specific educational material is discussed; 3) appropriate teaching methods are selected for the implementation of the goals; 4) the activities of the student community are organized in a certain way.

Based on the above scientific sources, in our opinion, it is necessary to know the didactic and educational goals of each activity. Didactic goals include:

- a) Study of new material (concept formation, laws and algorithms are established);
- b) Strengthening of learned knowledge (repetition, solving problems). Educational issues are also resolved in the training. In this:
 - a) arousing the interest of students and finding content;
 - b) to increase the responsibility of students to study, to instill love for the profession.
 - c) is to educate the need and skills to study physics. Textbooks, educational and teaching-methodical manuals, demonstration materials, demonstrated educational materials, technical tools, modern ICT and all the tools necessary for learning are used as educational tools in the teaching of physics and its departments in technical higher education institutions [38].

An innovative model of educational technology is a set of the most optimal form, tool, method, methodology and technology of education that guarantees the realization of the main goal and the achievement of the predicted educational results in the given time and existing conditions. The innovative model of educational technology includes the following elements:

clear expression of teaching goals;
selection of theoretical and practical material and determination of ways to convey it

to students; distinguishing the basic concepts and expressions of the topic; defining methods and technologies aimed at making students interested in reading; organizing the educational process individually and collectively; drawing up a training plan, based on it, determining the anticipated results of training activities;

The idea of pedagogical technology - the goal of the set module, so that the subjects of education jointly strive for a guaranteed result, the interactive methods chosen by them will bring positive results to the training. New modern methods - joint thinking of students, the teacher's method of influencing the student will be the main part of conducting the training. Interactive methods are manifested in the combined behavior of educational subjects (teacher and student) [43].

In traditional teaching, the main focus of the teacher is on imparting new knowledge to the student on the basis of the taught topic, in which he uses different methods and the teacher himself lectures more. Traditional teaching goals: focuses on how the audience is mastering the specified knowledge, works with students who have not mastered it, corrects students' mistakes, and constantly monitors their progress. Nowadays, new forms of teaching organization have emerged in the rapidly developing modern education system. One of the new forms of teaching organization is the person-oriented approach, which is the basis of traditional teaching.

The person-oriented approach in the educational system recognizes that not only teaching is important, but also the need to take into account the development of the individual, the knowledge, skills and abilities of the student, individual abilities and personal qualities based on the competence approach. The main goal of education in personalized teaching is to identify the individual abilities of each student and encourage them to develop their knowledge and become masters of their profession in the future. In individualized teaching, the teacher acts as a coordinator of dialogue and creates the necessary conditions for maximum activity of students. The teacher treats the students as partners without giving orders.

The goals of individual-oriented teaching: taking into account the personal interest of each student, offering forms of independent tasks by students, the teacher deals with

each student individually, corrects their mistakes, self-assessment competence is formed. Non-traditional training differs from traditional training in terms of its pedagogical goals. In order to effectively organize teaching of physics departments in technical higher education institutions, first of all, it is necessary to plan the teaching process in advance. For this, in technical higher education institutions, "Why is the physics department taught?", "What is taught in it?", "How should it be taught?", "What should be taught with the help of?" putting such questions on the agenda is appropriate for developing the competence of learners. In the physics department, planning each session clearly defines the learning objectives in advance. It is known that the goal is a product of achieving a predetermined result, which is a guarantee in advance of the acquisition of planned knowledge, skills and competences at the end of the joint activity of its subjects (teacher and student) in the educational process.

Based on modern interactive educational technology, in order to achieve efficiency in the teaching of physics in technical higher education institutions: the teacher should consider the effectiveness of the training process as the main criterion as a result of paying attention to the opinion and interest of each student; achieve the full development of students in the audience; humanization of training and free thinking formation of self-development communicativeness; when classifying students, it is necessary to take into account their psychological, personal characteristics and abilities [80].

Students will have to ensure their personal interests in every action. The conditions for the organization of modern classes on the basis of education are as follows: to create conditions for the development of the student's independent and free thinking and creativity without confrontation and to become the leader of his profession; realization of the student's abilities in a new order; to accept the student's identity as an equal, that is, to be an innovator of the student's profession, to take into account motivational interests, attitudes to new knowledge, to believe in the student's knowledge, thinking and capabilities; to determine in advance the positive results of turning the new knowledge and skills acquired by students from physics into skills and the growth of the student's general culture in the application of educational technology; taking into account the young psychological and physiological characteristics of each student; adapting the impact of teaching on the basis of the student's curriculum to the development and

variability of the student's thinking to the level of his personal capabilities; providing constant support and convincing the student to acquire independent knowledge, understanding, and development; to identify potential development prospects and dissatisfaction with one's profession, to objectively control them and to make a diagnosis and correct direction in time [177].

It is today's demand to develop the projects of each lesson related to the department of physics in technical higher education institutions based on the principles of pedagogical technology in the field of communicative approach and to introduce them into the educational process. Designing the process of teaching in physics, effective use of active methods of education such as modules, problem-based, discussion, electronic resources, electronic developments of the training, graphic organizers in the organization of lectures, practical and seminar classes on the subject will not only increase the activity of future physics teachers, but also future teachers of this subject helps them to have deep, broad theoretical and practical knowledge [130].

Unconventional education performs didactic functions, such as expanding the scope of knowledge of future technical engineers, educating them, activating them, and developing their ability to think independently. As it was noted in the experiments, if the training was carried out using the usual method based only on listening, students learned a maximum of 20% of the information, and when using advanced pedagogical methods, it was confirmed that this indicator increased to 80-90%. Non-traditional education is a complex process of cooperation between a teacher and a student to achieve an educational goal.

Conversational dialogue (Greek: dialogos - a conversation between two or more people), a question-and-answer way of teaching and learning. The leading task of the method is to make students interested: with the help of purpose-oriented and skillfully posed questions, students try to remember and explain their knowledge on the given topic, under the guidance of the teacher, they discuss with their fellow students, together with the teacher, they step by step independently think, conclude, conclude and generalize. understand and assimilate new knowledge. The advantage of conversation is that it activates students' thinking and helps to develop knowledge.

Interviews are divided into the following according to the task:

Introduction or organizer (didactic task: preparing students for work in training);
imparting new knowledge (didactic task: introducing students to new material);
synthesizing or strengthening (didactic task: systematization of students' knowledge,
remembering and thinking).

Interviews are divided into educational and round-table discussions according to their organizational form.

"Round discussion" differs from educational discussion in the arrangement of participants in a free state and, most importantly, in the fact that they express their opinions in turn. The most important thing is to formulate and ask questions correctly. They should be logically related. It should reveal the essence of the studied question, help to master knowledge in the system. The content and form of the questions should correspond to the level of development of future technical engineers. Easy questions do not encourage cognitive activity, while serious attitudes encourage learning.

Example: "Round discussion".

1. Does the density of a gas change when it is compressed and expanded?
2. If you lower one end of a glass or paper tube into water and start sucking from the other end, water will rise along the tube. Explain why.
3. There is a small hole in the plug that covers the top opening of the fuel tank of a car or tractor. If this hole becomes clogged with dirt, oil will stop entering the car's engine through the pipe at the bottom of the tank. Explain why this is so.

Debate is an active method of teaching in the form of discussion, exchange of ideas on a specific problem. The argument method does all the work. From this method: in the formation of new knowledge; future physics teachers to think deeply about one or another question, to ensure access to their essence; teaching future physics teachers to understand the difference between evidence and evidence-based conclusions; forming the skills of mutual exchange of ideas; It is used for the purpose of helping students stand firm in their personal opinion and defend it.

If the discussion develops freely, it will be free, it can be controlled. It should only cover topics and questions that need to be mastered.

Debate - discussion.

1. Explain how a liquid in an overturned bottle spills, even though atmospheric pressure acting from the bottom up is balanced by a column of liquid of a certain height. Why is there a sound when liquid flows from an overturned bottle?
2. Is it more difficult to drink the water when the neck of the bottle or water container is tipped with gypsum touching the lip?

Brainstorming is a collective idea of solving practical or scientific problems. During brainstorming, participants try to solve a complex problem: they create more personal ideas for solving it without allowing them to be criticized, then they separate their more effective ideas, discuss and develop them, evaluate the possibilities of proving or refuting them.

This method fulfills all tasks, but its main task is to activate students' educational activities, to interest them in independent understanding and solving of problems, and to develop in them the culture of communication, the skills and competences of exchanging ideas, freedom from thinking under external influence, and the primary way of thinking in solving a creative task. fosters overcoming [135].

Tasks to strengthen knowledge on the subject.

1. A right-angled wooden block D is placed inside a cylindrical container, and pressure is applied to it by means of a piston p. Brusok transmits piston pressure to which part of the tank? If there is water instead of a solid under the piston, which part of the tank will the pressure be transmitted to?
2. The following method is used to release oil from oil wells to the surface: water is pumped into the pit through a pipe with the help of a special pump, which acts on the oil and forces the oil to rise continuously. Which law of physics is used in this phenomenon?

2.2. Methodology of individual and differentiated approach to improvement of basic competencies

It is known that lectures are the main form of teaching physics in technical higher education institutions. Since the teacher works with all students during the lesson, he works according to the student with average knowledge. Such an approach to all students can bore good readers and, on the contrary, cause certain difficulties for those who acquire less. Therefore, the teacher has the task of taking into account the individual characteristics of the students, their cognitive abilities [147].

Taking into account the inclination, ability, interest, memory and thinking characteristics of students, it is necessary to approach each student individually, that is, to use the method of individual and differentiated approach to students during training. It is not appropriate to teach students the same starting from a certain course without taking into account their interests and abilities. In this case, if a more capable student starts to lose interest in studying, those with less knowledge will have serious difficulties in understanding and mastering the educational material. In this case, the quality and efficiency of training may decrease.

Differentiated approach means such a system of managing students' independent educational activities, which takes into account the individual characteristics of students, as well as the main characteristics of certain groups. Differentiated teaching is an educational process that involves managing students' cognitive activities in a certain system. An individual approach to teaching is understood as a system of managing students' cognitive activity, taking into account the individual psychological characteristics of each student. Accordingly, the organization of training is called individualized training [144].

In practice, various forms of classification of physics education are emerging. For example, the use of independent work options aimed at students with different preparation and independence levels is widely used. Depending on the preparation levels of the students in the same group, control works and control tests in methodical manuals and didactic materials are prepared in different variants. There are certain difficulties in creating options for differentiated independent work. Usually, such options are divided into 3-4 levels, but it is up to the student to decide which level option to choose [147].

The main principle of differentiation should be differentiated help from the teacher to the students, not the continuous simplification of the learning material. In order to apply a differentiated approach in educational practice, "hint cards" are used, one of which gives the solution to the problem, and the other gives a scheme or graph of the problem as a reference. In another case, a solution to a problem similar to the one given as a template is given. As a result, all students solve the same problem in the practical exercise, but the guidance and advice given to them is different. More difficult tasks are offered to stronger students in the group. Such tasks must be included in the textbooks or prepared by the teacher in advance.

Option I is grade I

1. What is the average speed of a car if it covers the first half of the road at a speed of 20 m/s and the second half at a speed of 30 m/s?
2. The length of the runway 675 m. What is the acceleration of the plane after 15 s on this path after take off? Consider the motion to be uniformly accelerating.
3. Determine the linear and angular velocities of the equatorial points in the daily rotation of the Earth? Earth radius 6400 km, 1 day 24 hours.

Option II is level II

1. Two trains are moving towards each other at speeds of 72 km/h and 54 km/h. It was found that the passenger of the first train passed the second train at 14 s. What is the length of the second train?
2. A train traveling at a speed of 43.2 km/h 180 m has crossed the road from braking to stopping. After how long did the train stop? What is its acceleration and what is its average speed?
3. A car of mass 1 t 100 m is moving on a curved road of radius R . If the speed of the car is 18 km/h, what is the centripetal acceleration?

Option III is level III

1. The object traveled in 5 minutes . 600 m How far will he travel in 0.5 hours at this speed?
2. Find the time taken by a car with an acceleration of 2 m/s^2 to increase its speed from 4 m/s to 12 m/s and the distance traveled during this time.

Individualization of physical education requires the joint organization of collective and individual activities of students in the training process and outside the classroom. The teacher is responsible for the organization, management and formation of students' cognitive activities [54].

The teacher directs student activities based on DTS requirements and the curriculum and model program. In accordance with the goals and tasks of education and training, the teacher chooses and uses various methods and tools to organize students' cognitive activities, to increase their independence, creative activity, and personal self-development competencies are formed.

One of the important conditions for performing these tasks before the teacher is the organization of individual independent work of students in the educational process. When performing such work, it is necessary to take into account the individual characteristics and interests of each student in the audience [164, 165, 166].

Independent individual work means work that is individualized according to its content, method of execution, or both content and method of execution at the same time. When doing independent work, group students can be given individualized tasks according to the method of execution. In this case, a separate task is given for each of the students in the audience . These tasks consist of different questions and problems of similar content and contain the same requirements.

Researching this approach is not the main component of the goals and tasks of this dissertation, therefore, it is necessary to focus on the types and forms of tasks that students should perform in the independent educational activities of students. When the teacher applies teaching methods in practice, he should not ignore the features of the learning activities of students with different learning abilities in the same group. It is necessary for the teacher to take into account the task of a differentiated approach to free assimilators in the classroom and outside the classroom. Such students are more interested in practical training than theoretical training, and private competence is formed [117].

Experienced pedagogues involve students more in practical work. For this, it is important that the teacher, while managing the independent learning activities of free-learning students and explaining new material to them, slows down the pace of explaining the difficult-to-learn areas of the subject, gives examples of practical aspects, and encourages students to ask questions.

It is necessary to differentiate the help given to free learners in completing the same task given to the majority of students in the audience. There are different types of this approach. They encourage independent activity of students and increase their interest in science.

For example, when solving problems, classifying the way to solve the problem, attaching a picture, scheme to the same task; if there is no answer to the problem when solving the problems, to provide the answer to the problem and information to solve the problem so that the student can control himself; encouraging them by pointing out their mistakes or approving the correctness of the initial step in solving the problem; show the necessary formula or the solution of a similar problem when solving a problem; allowing to see the answer of the problem [105].

A differentiated approach requires simultaneous attention to the preparation of better groups of students. Individual homework for developing abilities in a certain area has a different meaning in terms of content: these individual tasks for independent work involve independent reading of the materials given in the textbook under the special entry "for additional reading". It is appropriate to recommend such students to read understandable scientific and popular literature, news: tasks of the type "solve this problem in two different ways, solve such a problem independently" are especially valuable for them. It is also useful to entrust the student with an audience friend to carry out additional training aimed at eliminating the shortcomings of the student's knowledge on a certain topic. Such a supportive student position is an extremely effective means of stimulating learning for both the idle learner and the successful learner [68].

Psychologists V.A. Krutetsky [92], N.F. Talyzina [152], M. Mavlonov [96], E. Goziev [59] and others have developed some methods of determining student abilities, quantitative

criteria for student classification and individualization, their who determined that it is related to psychic characteristics. It takes into account the important general qualities of students, the ability to study. In the pedagogical research work of recent years, great attention is paid to the development of individual qualities of students during the teaching process. It is proposed to set up individual work such as written work in physics, written exercises and laboratory work. Some authors believe that the individual work of students in performing laboratory work, solving problems, and working with textbooks gives "good" results.

The importance of differential tasks in the organization of students' independent work in physics is highlighted in a number of literatures on the methodology of teaching physics. In most of them, students are divided into three dynamic groups in teaching according to their individual characteristics. Students with lower, average and higher education (groups I, II, III, respectively).

T.V. Cheremukhina said that the composition of the group changes during training. However, the only constant task for the teacher is to direct each student to the goal of using his maximum potential at the same stage of education [174].

Psychologist M.M. Mavlonov [96] defines three dynamic groups as follows [52]. Group I includes students who do not have even the simplest analytical skills, who cannot think physically, who cannot logically connect the internal structure of matter with its physical properties. They cannot solve the problem given to the audience, because its content and methods of implementation seem incomprehensible to the students of this group, and self-development competence is formed.

Group II - unites students who have the ability to think and act in a reproductive descriptive manner in solving a given physical problem. The main feature in them is to rely on previous experience: there is a desire to use it as a model in a new situation.

Group III includes students who are distinguished by a creative approach to the given problem of knowledge. They are distinguished by their high level of activity and multifaceted acquisition and implementation of problem options, high level of activity in finding the most effective method for solving given physical problems [96].

Students of this group have a wide and deep understanding of the material compared to students of groups I and II. In order to maximally approach the given problem, to provide new knowledge in training, it is important to know what kind of team is the same group, what is the level of intellectual development of some groups of students, to what extent their knowledge, learning, skills and qualifications are formed [96].

A set of didactic materials in the course of physics education and during the independent work of students is aimed at the differentiation of education depending on the individual psychological characteristics of students, and it is developed taking into account the different development of students' ability to acquire knowledge and their readiness to perceive and explain knowledge.

In the first stage of training, students of independent working group I are given only simplified tasks on the application of specific, non-generalized knowledge.

Students of the II group are given tasks of average complexity on the analysis of the knowledge gained in the previous lesson and new material.

Group III will be given complicated assignments to generalize and distinguish the main ones.

Among the innovative pedagogical tools and methods, research activity takes a leading place. For this purpose, it is appropriate to conduct research in educational and extracurricular activities. Its task is to develop competence in students, to develop independent creative activities, to involve them in research work, to get acquainted with the methods of scientific and creative work, to feel that their knowledge is more necessary, to communicate with their peers, allows scientific experience and participation in research work.

In the process of solving problems, news is encountered, and students become interested in solving it, there is a need for this, but research in the educational process differs from real scientific research in several important aspects. Educational problems investigated in the process of problem-based education, scientific research carried out by students are not considered new. Student research is completely different from the

research of scientists, the research conducted under the guidance of the teacher should be understood as "I achieved it independently". A student who experiences the joy of discovery does not hesitate to tackle the next task, they know that the joy of discovery comes after the difficulty of the search.

When research technology is used, the following goals are set: Involve all students in research activities. Teaching students to work with scientific literature. To receive reviews of students' scientific work, to participate in conferences. Preparation of Olympiads from students. In this regard, the student must perform the following tasks:

To activate students' need for research. Involvement in research activities;
Search for tools that activate the knowledge process;
To inculcate (increase) in the student's mind that the research work is effective;
Creating conditions that stimulate knowledge activity [43].

Research and research education is not only about acquiring knowledge and searching for new knowledge, analysis and synthesis are generalized. Choosing a course of action and making a decision, creating a culture of deliberative conduct, is a discussion. This approach is summarized in 2 variants:

Study of practical information aimed at practical knowledge and research aimed at theoretical knowledge. Research and inquiry-based learning technologies rely on human thinking skills, where knowledge acquisition is aimed at facilitating human thinking, memorization and practical application. If the students do the research independently, the teacher should ask special questions from time to time and pay attention to connecting the studied material to the basic concepts.

New knowledge and information, practical examples, promotion of ideas to solve the identified problem, evaluation of information, search for them at a higher level. Starting to solve the problem is to separate the most necessary from the found information, to advance the acquired knowledge, to analyze and evaluate the ideas, to select the best for integration. Summarizing the separated information, formulating problem solving methods, looking for a way for others to recognize the found result.

Enabling students to test and analyze their scientific hypotheses by conducting experiments. By developing a training process based on research technology:

Interactive technologies used in research technology to the level of knowledge and concepts, its implementation. Project-research technologies, problem-based learning technologies, project methods technology will be used among students in the 2017-2020 academic year based on the following scientific-research works, from innovative ideas to research and practice. One of the independent learning methods of students is to organize independent learning activities for students to independently analyze the facts and materials and discover the essence of new concepts and methods of activity [148].

The research method consists of independent analysis of the stated factual materials and organization of students' activity to discover the nature of new concepts and methods of activity, rather than the teacher's giving information in the form of a conversation. The essence of the research method is that the discovery of new rules is not done by the teacher with the participation of students, but under the guidance of the teacher and with his help, the students themselves do it independently. The research method is to describe the educational material in the form of a dialogue:

- a) use of some issues and tasks in the presentation of new knowledge;
- b) asking questions and assignments to analyze and summarize the educational material;
- c) applying cognitive issues for smaller research, proving conclusions, rejecting misconceptions;
- g) organization of comprehensive discussions on independent knowledge of topics.

The research method is organized by the teacher mainly by setting the students a highly important theoretical and practical research task. The difference between tasks in the description of research and tasks related to research is that in the research method, students perform work on collected facts (experiment, observation, work on literature) and their theoretical analysis, systematization and generalization, discoveries and inventions are the analysis of factual materials by students will appear as a result of generalization [47].

In learning based on the research method, factual material is given to the student by the teacher and analyzed together. With the help of the teacher, the student reveals the essence of a new concept.

Educational features of programmed teaching - organization of an educational process in which students independently acquire new knowledge and action skills with the help of specially prepared didactic tools. Since programmed learning is associated with a special type of student independent work, it can be considered a form of independent learning, and a programmed guide can be considered a textbook for learning. Programmed tasks consist of a system of tasks that require students to partially recall and partially acquire new knowledge.

The most common ways to create elementary fragments are the method by which answers are chosen:

a) consists of information in the form of conclusions and rules for which ready answers to questions are obtained; b) feedback necessary to control the correctness of answers.

The essence of the research method is that the discovery of new laws and regulations is not carried out by the teacher with the participation of students, but under the guidance of the teacher and with his help, the students themselves do it independently. The research method is to describe the educational material in the form of a dialogue: a) use of some issues and assignments in the presentation of new knowledge; b) asking questions and tasks for analyzing and summarizing the educational material; c) applying cognitive issues for smaller research, proving conclusions, rejecting misconceptions; g) to organize comprehensive discussions on independent knowledge of topics [144].

In the research method, the student independently performs logical operations and discovers the essence of new concepts and new methods of action. The progress of the student's reasoning, the correctness or incorrectness of the conclusions is determined by the teacher during the conversation with the student or when he reports the result of his research orally or in writing. In learning based on the research method, the material is given to the student only by the teacher and analyzed together. The student reveals the essence of the new concept with the help of the teacher. The difference between

tasks in the description of research and tasks related to knowledge includes the cycle of independent educational-cognitive activity of students from collecting information and analyzing it, from independently posing problems to solving them, checking the solution and applying new knowledge in practice. Students should have the steps to observe, collect and analyze materials, explain and apply the laws and rules they discover, just like scientific research. One of the features of the tasks in the research description is the analysis of the previously collected materials [14].

According to the forms of organization of research work, it can be diverse: student experience; participation in scientific experiments; excursion; study archives; preparing lectures, reading them in the presence of students. Features of programmed teaching education - organization of an educational process in which students independently acquire new knowledge and action skills with the help of specially prepared didactic tools. Since programmed learning is associated with a special type of student independent work, it can be considered a form of independent learning, and a programmed manual can be considered a textbook for learning. Programmed tasks consist of a system of tasks that require students to partially recall and partially acquire new knowledge [135].

The use of programmed tasks is as follows: each task consists of certain elements; each element is considered a part of the material, and questions and answers are expressed in the form of statements of new knowledge or exercises. The most common ways to create elementary sections are the method by which answers are chosen:

a) consists of information in the form of conclusions and rules for which ready answers to questions are obtained; b) feedback necessary to control the correctness of answers. From the experience of organizing problem-based education, it was found that there are two types of use of traditional methods in combination with programmed education: a) some types of students' independent works and the use of programmed elements in the presentation of knowledge; b) the use of a system of programmed assignments on a certain topic or section as a method of organizing students' cognitive activities.

The use of such methods is of great importance both in terms of time and in terms of the size of the educational material, in the independent acquisition of knowledge by students under the guidance of the teacher and in the formation of independent work skills and qualifications.

2.3. Use of practical educational issues aimed at developing students' competences in physics

The term "Practical skills" in physics is also broad and no single definition has been accepted. Some researchers (V.G. Razumovsky [128]) associate it with professional activity [128]. For example, in metalworking (cutting, slotting and grooving, welding, surface cleaning, etc.), wood, tin, wires, etc. means working with things. Such work is carried out during the training of hand-made instruments, in the classroom outside the classroom, and at home. A.V. Usova [164, 165, 166], A.A. Bobrov [165] and others mean experimental skills by practical training:

1) forming the purpose of the experiment; 2) put forward a hypothesis, an idea that can be put on the basis of the experiment; 3) development of the principle scheme of the experimental device; 4) drawing up a plan for conducting the experiment; 5) selection of tools; 6) assemble the device; 7) conducting an experiment; 8) processing of obtained results; 9) understand the estimation of errors of measurements and calculations. Assembling electrical circuits, recording instrument readings, and creating graphs are listed in state education standards and curricula. Experimental skills should be developed during laboratory and physical practicum work [128].

V.G. Razumovsky [128] and others incorporate design skills into practical skills. But the concept of "design skills" is not disclosed by the authors. Constructive skills should be developed during creative assignments and laboratory work.

There are points of view that practical skills are the ability to solve physical problems. For the formation of practical skills: issues related to production and technical content (A.V. Usova [164, 165, 166] and others), issues related to research, issues related to inventiveness, problem-problem from physics, problem-evaluation, creative problems from physics, experimental issues on the construction of technical objects (V.G. Razumovsky [128], P.L. Kapitsa [82] and others) tasks for laboratory works N.Ya. Lanina [93], R.I. Malafeev [97], S.F. Pokrovsky [162], B.M. Mirzakhmedov [105, 106], M. Qurbanov [116], Yu.G'. Mahmudov [101] and others developed special didactic tools. In issues of production and technical content, the authors try to illuminate the structure and principles of operation of machines and mechanisms, technologies of industrial and

agricultural production, controlled tools. By this, they intended to provide information to students about new advances in technology in the process of problem solving. For example, 15 t of coal is used in 1 hour in a turbine generator with a 40 MW steam boiler installed in the IES. The heat of combustion of the used coal is 29 MJ/kg. The temperature in the turbine is 570 °C, the temperature in the condenser is 30 °C. Compare the real FIK of the Energoblok with the FIK calculated for an ideal heat engine operating on the Carnot cycle. In our opinion, the student who starts to solve the problem, first of all, focuses his attention on the physical quantities in it and the formulas necessary for solving the problem. The technical object itself does not interest him. Because he does not participate in student activities.

It is planned to form the following competences in physics for the general secondary and special secondary education system.

1. Competence to observe, understand and explain physical processes and phenomena.
2. Competence to conduct experiments, measure physical quantities and draw conclusions.
3. Competence to use physical knowledge and tools in practice.

These competencies are developed in higher education institutions, which are an integral continuation of general secondary education. Solving practice-oriented "typical problems" is important in the development of these competencies in students. For this, it is necessary to use the knowledge of physics to distinguish typical problems related to the solution of such problems encountered in their daily life and to teach students the method of solving them.

A typical problem is a goal that is set before a person many times in certain life situations. Typical problems that can be solved with the help of the knowledge acquired in physics in a person's professional activity and in everyday life can be divided into the following types:

1. Creating objects with given properties.
2. Development of a technology (method) for solving a specific problem.
3. Elimination of deviations of object parameters from the specified norm.
4. Keeping the object without changing its given properties or moving it

from one place to another. 5. Finding or evaluating the physical parameters that describe the object in a specified state. 6. Management of facility operation, technological process. 7. Operation of the technical object.

Let's give some of the typical problems that can be solved with the help of the knowledge acquired from physics in the problems faced by a person in his daily life [159, 160].

I. On the creation of objects with given properties:

1. Soil moisture for indoor plants should always be within a certain standard. Design this dehumidifier when you go on vacation and go somewhere else to relax. 2. There are power cuts in many places. What can be done to prevent the products from spoiling in the refrigerator? 3. Come up with a device that gently closes the entrance door without much force. 4. Offer a device that makes a pleasant sound when a newspaper or letter is placed in the mailbox.

II. Development of problem solving technology.

1. In many refrigerators, the freezer compartment becomes thickly covered with snow and ice. Figure out a way to unfreeze it quickly.
2. It is known that tears flow when onions are sliced. Suggest ways to get rid of it.
3. The roads are frozen outside. Recommend safety methods for commuting from home to your school?
4. The measuring limit of your home scale 5 кг. So 10 кг how do you measure something?
5. You want to move heavy furniture from one place to another in the house. Suggest a way to reduce friction in doing so.
6. Suggest methods to slow down the evaporation of liquid.

III. Eliminating the deviation of object parameters from the specified norm.

1. How to check that there is no short circuit in the electric kettle?
2. If the humidity in your room is high, how can it be normalized?
3. How to get rid of the unpleasant smell from pets?

IV. Keeping the given properties of the object unchanged or moving from one place to another.

1. One summer day, the refrigerator in the house broke down. How to store food without spoiling until it is fixed?
2. You came to the country yard on hot summer days. How would you store food without refrigeration?
3. Hot food should be brought to the patient in the hospital. How can it be served hot without a thermos?

V. Finding or estimating physical parameters that describe an object in a specified state.

1. You have 0,8 лa glass jar. Can it fit honey 1 кг?
2. How to determine the strength of the artificial fiber (kapron fishing line) thread used for fishing?
3. Is it possible to determine the depth of the well while standing on the ground?
4. How to estimate the room temperature without a thermometer?

VI. Management of object operation, technological process.

1. In an Uzbek folk tale, the stepmother instructs the little girl to mix a bag of mash and a bag of corn grains and separate them overnight. Help me sort it out.
2. Invent a device that controls the temperature in an electric oven.
3. Design a device that controls the flow of water and gas in a gas-heated column.

VII. Operation of the technical object.

1. Write the sequence of actions to be performed when replacing the printer cartridge.
2. Tell the disk what to do to write more information than its specified size.
3. Find a way to charge your mobile phone in a place where there is no electricity.

The problems of creative description are understood as problems that are known in advance, but which are newly opened or invented by students. For example, determine the initial velocity of a bullet fired from a toy pistol and the length of the compressed spring.

The main role in the process of setting the problem is given to the teacher. In the next process, students are sometimes wrong and sometimes right, and offer their own ideas. The audience draws and discusses pictures and diagrams on the blackboard or flipchart paper. They select the most acceptable one from among them. The teacher acts as a guide in this process [85].

Students do not remember the technical objects presented in the textbook, so they do not realize that physical knowledge serves as a basis for solving many household problems, not only professional. If the typical problems covering professional and household issues are separated and the methods of solving them are explained to the students, the principle of practice-oriented training can be effectively implemented [105, 106]. For this, it is necessary to do the following:

1. Determining what kind of issues a person may encounter during his life can be solved with the help of the knowledge obtained from physics.
2. Selection of problems to teach how to solve typical problems during physics course study in technical higher education institutions.
3. Learning the method of solving each typical problem.

Issue 1. Developing a technology to solve a specific problem.

1. We determine the purpose of the activity: To develop a technology for solving a specific problem. 2. We determine that the formed goal includes the above-mentioned elements: the specified activity - development; the resulting product is indicated - technology (method), that is, the system of performed works; the formation of the goal on the property of the resulting product is not clearly indicated, that is, it is not clear why the system of actions should be developed [155].

Let's change the activity target so that all elements are displayed. The analysis of the presentation of many professional and household issues shows that they contain the technology of creating objects with given properties and methods of performing work with certain objects under certain conditions. For example: the technology of creating blocks, technical elements, adjustment work of technical devices, etc. [43].

Similar tasks are also found in household activities: moving furniture from one place to another at home with less friction, etc. [56, 57].

We reformulate the purpose of the work in the following way:

Creating a system of work to be performed for the development of an object with given properties; development of a system for performing work in certain objects and conditions.

From this, issue 2 is divided into two parts.

3. The method of solving the first part is similar to the guiding step of solving the typical problem 1.

Let's highlight the scientific knowledge that must be mastered in this topic (see table 2.3, 2.4).

Example 1. Let's say, "Ideal gas equation of state. Let the subject of "Gas Laws" be studied. Let's highlight the scientific knowledge that must be mastered in this topic: understanding of the system of actions; understanding of object properties; understanding of the state of the object; conditions for the existence of an object with given properties; understanding of physical phenomena and processes that lead to a change in the state of an object; conditions for the implementation of these events, processes, effects; boundary descriptions of the impact of the environment on a person; laws that allow to estimate energy costs for obtaining objects with given properties; information about the tools and materials used to assemble the designed experimental device; the rule of making a program of actions.

We compare the list of knowledge needed to perform the actions with the knowledge in mastering the subject [164].

Table 2.3 Course of events

Concepts			
Physical objects	Physical phenomena	Status	Physical quantities
<ul style="list-style-type: none"> - saturated steam; - unsaturated steam; - boil in temperature standing liquid 	<ul style="list-style-type: none"> - boiling; - evaporation; - condensation; 	<ul style="list-style-type: none"> Dynamic balance 	<ul style="list-style-type: none"> - boiling temperature; - absolute, relative air humidity; - critical temperature; - dew point; - partial pressure of water vapor
Scientific facts			
<p>The saturated vapor pressures of different substances are not the same.</p> <ol style="list-style-type: none"> 2. At a temperature above the critical temperature, it is impossible to change the pressure of the gas and turn it into a liquid. 3. Boiling begins at the temperature when the saturated vapor pressure inside the bubbles equals the external pressure. 4. As the external pressure increases, the boiling temperature increases. A decrease in pressure leads to a decrease in the boiling point. 5. Each liquid has its own boiling point. 6. The temperature of the liquid remains unchanged during the boiling process. 7. The intensity of evaporation of water from living organisms and the reduction of humidity is determined by how close the water vapor is to the saturated state under the given conditions. 			
Laws			
<ol style="list-style-type: none"> 1. Saturated vapor pressure does not depend on its volume. 2. Saturated vapor pressure depends on temperature. This relationship is not linear. 3. At a constant temperature, the concentration of saturated vapor pressure does not depend on its volume. 			
Technical objects			

1. Hygrometer.
2. Psychrometer.

Table 2.4 Course of events

Concepts		
physical phenomena, about processes	Of the process conditions of departure	About physical quantities
- isothermal - isobaric - isochoric	m=const; T = const; m=const; R=const m=const; V=const	Universal gas constant
Laws		
<ol style="list-style-type: none"> 1. Ideal gas equation of state: $pV/T = \text{const}$ 2. Mendeleev – Clapeyron equation: $pV = m/M \cdot RT$ 3. Boyle-Marriott's law: $pV = \text{const}$, if $T = \text{const}$, $m = \text{const}$, $M = \text{const}$. 4. Gay-Lussac's law: $V/T = \text{const}$ if $p = \text{const}$, $m = \text{const}$, $M = \text{const}$. 5. Charles' law: $p/T = \text{const}$ if $V = \text{const}$, $m = \text{const}$, $M = \text{const}$. 		

The concept of the system of actions (method, technology) is not included in the topic; the understanding of the state of the object and its properties is presented in previous topics (gas, gas properties, ideal gas, physical quantities representing gas properties: pressure p , volume V , temperature T); the conditions for the existence of the object with the given properties are given (the state of a sufficiently rarefied real gas is represented by the equation of state of an ideal gas); Concepts of physical phenomena and processes leading to changes in the state of an object are introduced (isothermal, isobaric, isochoric processes); the conditions for the implementation of these events, processes, effects are given (conditions for the progress of the processes); limit descriptions of environmental effects on humans are not provided; no laws have been introduced that allow for the assessment of energy costs for obtaining objects with given properties; information about the tools and materials used to assemble the designed experimental device is not considered; the rule of creating a program of actions is not considered in this topic. Because they are not physical knowledge, but methodological knowledge [106].

The analysis shows that scientific knowledge is not enough to perform all actions. Boundary descriptions of the impact of the environment on a person are not provided, and laws are not included that allow for the estimation of energy costs for obtaining objects with given properties. These cannot be done on the basis of the developed method. Information about tools and materials for the developed technical device project, methodological knowledge can be included when solving this problem.

Typical issues in studying the physics course of technical higher education institutions. The typical issues that have been identified will have the principle of orientation to practice. Students should be given a specific question [166]. Accordingly, the teacher should formulate a specific problem to be solved based on this topic.

Let's say that in the study of the topic "Fundamentals of molecular-kinetic theory", the teacher should teach the students how to solve the 5th typical problem called "Finding or estimating the value of physical quantities representing the properties of an object in a certain state".

The physical quantity whose value is found or estimated must firstly be selected from among the quantities included in this topic, and secondly, the value of this quantity should be significant for a person. So, it must be of domestic or professional importance. Of the quantities included in this topic (size, molecular mass, average square speed of gas molecules, molecular mass, relative molecular mass, Avagadro's number, gas concentration, molar number, etc.), only gas concentration is significant for humans.

For example, let's consider the situation where the gas concentration is important in monitoring the air condition in the zone that is ecologically dangerous for humans [99, 159].

The permissible concentration of N_{2S} (hydrogen sulfide) gas is 0.008 mg/cm^3 . Is this requirement fulfilled in a windless summer day with an air temperature of 35°C and normal atmospheric pressure?

2. Estimate the concentration of exhaust gas from a car parked at a traffic light.

3. Estimate the concentration of exhaust gas emitted from one car into the atmosphere.

Thus, it is possible to use typical practice-oriented issues in the formation and development of students' competencies.

These competencies are formed in training processes organized for each subject, embedded in the content of the subject. At the same time, competences related to this subject are also being formed in training.

Complicating the experiment for gifted students, the problem of determining the density of the substance from which the test tube is made can also be given. For this, students will need to determine the specific volume of the test tube. First, water is filled into the test tube, and its volume V is internally determined according to the water level by pouring it back into an empty beaker. Then the test tube is filled with water and completely immersed in the water in the beaker, and $\rho_{\text{проб}} = \frac{m}{V}$, the density of the test tube is determined using the external formula from the water level that rises in the beaker.

Qualitative experimental tasks, the experiment is not carried out completely. For example, a student can be assigned to determine the atmospheric pressure force acting on a sheet of notebook paper or a table surface.

Only the surface of the notebook or table is measured. But the student cannot measure atmospheric pressure. It is obtained from weather data. The result of the experiment is not checked. Experiments of the second type are of great practical importance.

Experimental tasks can be used at different stages of training. Most importantly, it should surprise and interest students. Some difficult experiments can be given as homework if they are conducted in optional and group activities, and those that can be conducted at home. Fun experiments can also be used at the end of science month parties.

Below are examples of experimental tasks for students to try out together.

1. Using a ruler, determine the dimensions of the lump of sugar and calculate its

volume. Fill the beaker halfway with water and check its level. Drop sugar cubes into it one after another and watch it completely melt. Then record the next water level and determine the volume of water raised by the difference in levels. Compare the volume of water raised with the volume of sugars. Explain the difference based on physical laws.

2. Take the bag that has been emptied of water and put the funnel on its mouth. Seal the mouth of the funnel and the bag with gum or plasticine so that air does not escape. Pour water into the pan through the funnel. In this case, determine how much water will go into the pan. Find out why the tank is not filled with water.
3. On the table there is a U-shaped pipe, water, gasoline and a ruler. Using them, determine the density of the oil.
4. Using a cylindrical container, a stopwatch, and a barbell, determine the rate at which water flows out of a faucet.
5. How to determine the air pressure inside a soccer ball using a ruler and a sensitive scale?

There are theoretical and practical learning materials in teaching physics, and among the practical learning materials, the main one is solving problems. In the process of solving problems, along with imparting knowledge to students, it is important to form and develop their communicative, mathematical literacy, self-development competencies, and to develop and educate their abilities. In the process of solving physics problems, technical specialists become more interested in their profession, expand their logical thinking, and develop their creative-scientific research and abilities. They understand the basic nature of physical phenomena more widely, they understand the practical application of the laws of physics more deeply. They understand the fundamental nature of physical phenomena in physics, learn to apply their laws in practice.

Also, the function and structure of physical measuring instruments will be studied in depth, they will get acquainted with the working principles and acquire the skills and qualifications to deal with them, and the students will be trained in such qualities as hard work, courage, and willpower [52].

In order to increase the interest of future technical students in physics and to form

and develop basic competencies, practical and technical issues cannot be used in the educational process. By solving such problems, students develop logical thinking and observation skills. Technical professionals learn to think critically and analyze results. The solution to problems of non-standard description of IV-V difficulty of physics is not immediately found, but it is achieved with several attempts and difficulties, the student begins to achieve important qualities such as perseverance and strong will to cope with these difficulties [146].

for the student to enjoy the feeling that he has achieved the result with difficulty and that the way of solving is not traditional. Dealing with logical, interesting problems that are more complex than physics allows future technicians to deepen their study of science and repeat concepts they have previously learned.

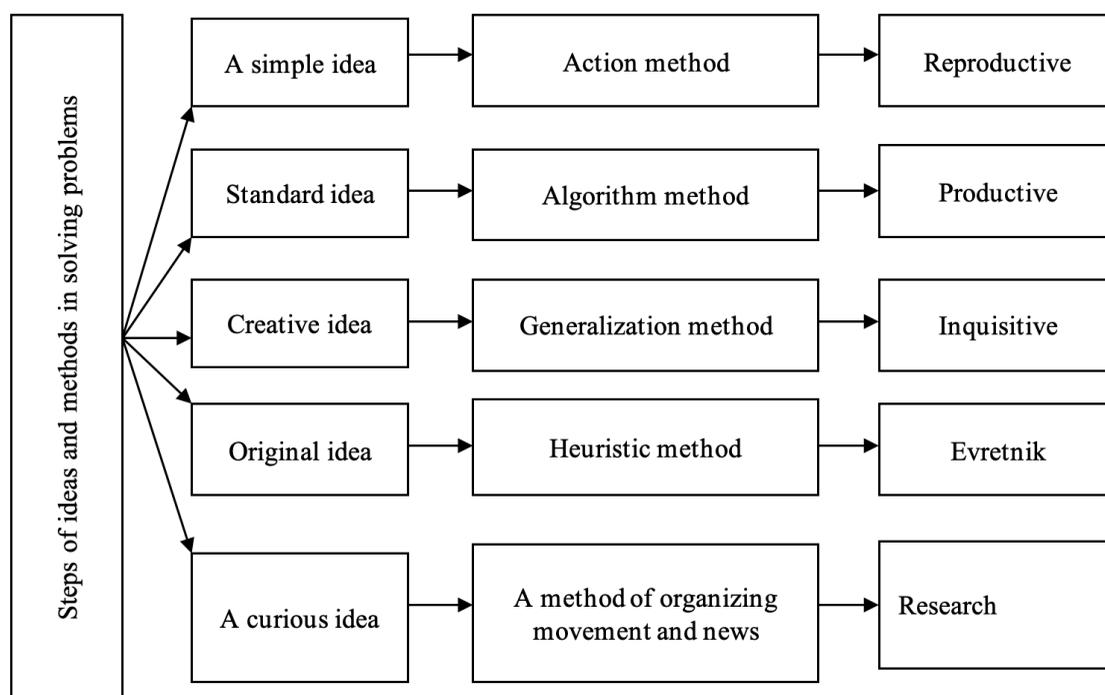


Figure 2.3 Steps in solving problems

Therefore, the introduction of such types of issues leads to the realization of basic competencies and unique talents. Depending on the content of the issues, they are divided into mechanics, molecular physics, electromagnetics, optics, atomic departments, each

of these issues is different in terms of content and level of complexity. These issues are aimed at a specific goal and are solved by different methods (Figure 2.3).

According to their essence, the issues can be divided into two types. I physical issues; non-creative matters.

A creative problem encourages the student to think independently, to think logically, to fully understand the content of the problem, problems of this type are distinguished from other types of problems by the level of complexity [72].

V. G. Razumovsky [128] stated that the unknown problem for the student is a creative problem. In the process of solving a creative problem, when the student thinks independently, they should not separate the problem condition, requirement, and solution methods from each other. To solve the problem independently, the student refers to previously solved problems, if he is not satisfied with clear answers, he looks for a new solution method, which changes the condition of the problem and clarifies the goal [128]. I. Ya. Lerner says that a creative problem differs from a non-creative problem in that the student achieves results that are new to him in the process of independent work, as a result, new thinking appears [95].

At the beginning of the academic year, in order to determine the ability of students to solve problems, written assignments were taken as follows, and at the end of the semester, and the results were analyzed (see Table 2.5).

Table 2.5 Analysis of written work results:

Educational directions	At the beginning of the semester						At the end of the semester				
	Number of students	5 points	4, thank you	3 points	2 points	%	5 points	4 points	3 points	2 points	%
Chemical technology	29	4	10	12	5	43.96	7	12	8	2	65.5
	30	3	11	10	6	46,66	5	15	8	2	66.6
	31	5	9	8	7	45.1	4	16	10	-	64.5

Electric energy	30	4	8	13	5	40	6	16	8	-	73.3
	29	5	10	9	5	51.7	5	12	8	4	68.9
Road engineering	31	4	11	9	7	48.4	6	18	5	2	77.4
	29	8	10	7	5	62	10	12	7	-	75.8
	28	3	8	7	10	42.8	8	13	3	1	75

It should be noted that if the system of selected questions, as well as each question, meets the following requirements, such a question will be of educational and educational value:

1. What kind of knowledge students should have in order to solve the problem independently.
2. The issue should be interesting for the student.
3. What is the educational and scientific importance of the issue.
4. Know how the issues differ from each other.
5. Each issue should have a clear purpose.
6. The teacher knows how to help the student.
7. To know what achievements the student has achieved in solving problems by searching creatively.
8. Knowing that the issues are related to each other.

1. Simple issues. Problems of this type serve to strengthen newly learned laws and concepts, to interpret the meaning of formulas, to find one or another quantity from ready-made formulas. Such issues require not only the restoration of memorized knowledge, but they are necessary as the first step in mastering the learned material. Such issues can be solved during training and during circle training. We present such types of issues. They are given to students to solve independently. When we passed the topic of pressure, we found it necessary to give the following issue for independent solution. By solving simple problems independently, self-confidence appears [101].

Examples of problem solving

The problem is a cylindrical drum located $\vartheta = 1 \text{ m}/ch = 6 \text{ m}$ above the water level of the boat is being pulled towards the shore of the lake by means of a rope winding at a constant speed (Fig. 1.1). find the relation \mathcal{G}_q of the speed of the boat to the length L

of the rope. Specifically, the speed of the boat when $t = 1$ сек. $L = 10$ m and from this situation determine the distance it moves over time. (Fig. 2.4, 2.5)

Given: $h = 6$ m ; $v = 1$ m/s ; $L = 10$ m ; $t = 1$ c.

Need to find: $\vartheta_q = ?$; $\Delta s = ?$

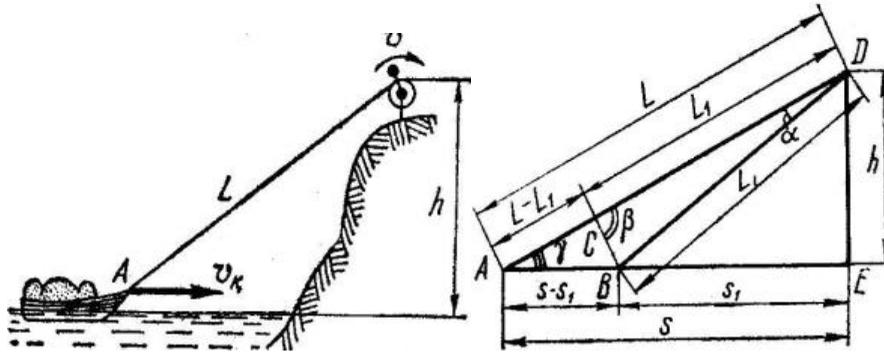


Figure 2.4.

Figure 2.5.

Resolution : Very small t the boat from point A to point B in the same amount of time $s - s_1 = \vartheta_q t$ be moved to the distance (Fig. 9). At the same time, the rope in the position AD takes the position BD, where its length is $L - L_1 = \vartheta$ decreases in size. t in a very small amount of time α the angle will also be small. Therefore, BCD is an equilateral triangle β the angle is very little different from 90° . Therefore, considering the triangle ABC as right-angled and

$$\frac{L - L_1}{s - s_1} = \frac{\vartheta}{\vartheta_q t} = \frac{\vartheta}{\vartheta_q} = \cos \gamma$$

can be written as; from this $\vartheta_q = \frac{\vartheta}{\cos \gamma}$. As the boat approaches the shore γ the angle increases and ϑ_q increases. it appears that $\cos \gamma = \frac{s}{L} = \frac{\sqrt{L^2 - h^2}}{L}$. Therefore at $L = 10$ m

$$\vartheta_q = \frac{\vartheta L}{\sqrt{L^2 - h^2}} = 1,25 \text{ m/s.}$$

Formula for the distance traveled in uniform motion to find the displacement of the boat $s - s_1 = \vartheta_q t$ only t the time interval is small enough to be used when the speed of the boat does not change significantly during this time [38].

$$\Delta s = s - s_1 = \sqrt{L^2 - h^2} - \sqrt{L_1^2 - h^2} = \sqrt{L^2 - h^2} - \sqrt{(L - vt)^2 - h^2} = 1,25 \text{ m}$$

Answer: $v_q = 1.25$ m/s; $Ds = 1,25$ m.

2. *Quality matters.* Calculations are not required to solve problems of this type. Using the physical laws learned, students analyze the phenomena in the problem in two stages. The methodological advantage of this type of problems brings the studied theory closer to life, increases interest in science, leads students to develop their observation skills and teaches them to be careful about physical phenomena occurring in life.

For example, copper and wooden balls of the same volume fall from the same height. Which ball hits the ground first?

Answer. In solving this problem, it is noted that the volumes are the same, but the densities of wood and copper are not the same, that is, they differ in mass, but the volumes are equal, and the cross-sectional area is the same in both. The density formula is written and the problem is solved. Therefore, the copper ball falls first, because the density of the wooden ball is 12.7 times greater than the density of the copper ball.

3. *Quantitative issues.* It plays an important role in the formation and development of scientific knowledge in students. Students learn to remember formulas, measure units of quantities given to it, and calculate. For example, when choosing quantitative calculation problems, it is necessary to gradually move from simple to complex problems. Otherwise, if students cannot solve the problems, their interest in science fades and their activity decreases. When solving a problem, it is necessary to encourage each of the student's ideas, smooth out and explain the shortcomings, in short, until the student's psychology is adapted to solving problems, it is necessary not to escape the teacher's attention, the teacher should be able to follow him, only then the result will be effective. We present the following issues:

Issue 1. A lens is being pushed between the fixed object and the screen. In two positions of the lens, h_1 and h_2 -sized images of the object are formed on the screen. What is the size of the item?

Given:
 $h_1 = h_2$

Solution :
Since the lens is unchanged, its focal length is the same in both cases.

F=const;

$$f_1 + d_1 = f_2 + d_2 \quad \frac{1}{F} = \frac{1}{f_1} + \frac{1}{d_1} \quad \frac{1}{F} = \frac{1}{f_2} + \frac{1}{d_2} \quad \frac{1}{F} = \frac{1}{F}$$

$$h=? \quad \frac{1}{f_1} + \frac{1}{d_1} = \frac{1}{f_2} + \frac{1}{d_2}; (1)$$

In this case, the distance between the item and the screen is the same

$$f_2 + d_1 = f_2 + d_2; (2)$$

Magnifications of the lens in the first case in the second case;

$$K_1 = \frac{f_1}{d_1} = \frac{h}{h_1} \Rightarrow f_1 \frac{h_1 d_1}{h} \quad K_2 = \frac{f_2}{d_2} = \frac{h}{h_2} \Rightarrow f_2 \frac{h_2 d_2}{h}$$

f_1 and We find h by putting the value of f_2 (1) into formulas (2).

$$(1) \quad \frac{1}{\frac{h_1 d_1}{h}} + \frac{1}{d_1} = \frac{1}{\frac{h_2 d_2}{h}} + \frac{1}{d_2} \Rightarrow \frac{h}{h_1 d_1} + \frac{1}{d_1} = \frac{h}{h_2 d_2} + \frac{1}{d_2}$$

$$\left(\frac{h}{h_1} + 1\right) \frac{1}{d_1} = \left(\frac{h}{h_2} + 1\right) \frac{1}{d_2} \quad h_1 d_1 + h d_1 = h_2 d_2 + h d_2$$

$$d_1 (h_1 + h) = d_2 (h_2 + h)$$

$$\frac{d_1}{d_2} = \frac{\frac{h}{h_1} + 1}{\frac{h}{h_2} + 1} = \frac{(h+h_1)h_2}{(h+h_2)h_1} \quad \frac{d_1}{d_2} = \frac{h_2 + h}{h_1 + h}$$

$$\frac{d_1}{d_2} = \frac{d_1}{d_2} \Rightarrow \frac{(h+h_1)h_2}{(h+h_2)h_1} = \frac{(h+h_2)}{(h+h_1)}$$

$$(h+h_1)^2 h_1 = (h+h_1)^2 h_2$$

$$(h^2 + 2hh_2 + h_2^2)h_1 = (h^2 + 2hh_1 + h_1^2)h_2$$

$$h^2 h_1 + 2hh_2 h_1 + h_2^2 h_1 = h^2 h_2 + 2hh_1 h_2 + h_1^2 h_2$$

$$h^2 h_1 - h^2 h_2 = h_1 h_2 - h_2^2 h_1$$

$$h_2 (h_1 - h_2) = h_1 h_2 (h_1 - h_2)$$

$$h^2 = h_1 * h_2$$

$$h = \sqrt{h_1 * h_2} \text{ answer : } \sqrt{h_1 * h_2}.$$

Problem 3 Exit work 3.8 · The maximum kinetic energy of photoelectrons flying out of lithium, which is 10^{-19} J , is $W_k = 0.2$. If it is 10^{-19} J , find the wavelength of the light rays that cause the photoeffect. $s = 3 \cdot 10^8 \text{ m/s}$.

Given:

$$A = 3,8 \cdot 10^{-19} \text{ Ж}$$

$$W_k = 0,2 \cdot 10^{-19} \text{ Ж}$$

$$c = 3 \cdot 10^8 \text{ м/с}$$

$$h = 6,63 \cdot 10^{-34} \text{ Ж} \cdot \text{с}$$

$$\lambda - ?$$

Solving:

$$h\nu = A + \frac{mv^2}{2}$$

$$h \frac{c}{\lambda} = A + \frac{mv^2}{2}$$

$$2hc = \lambda(2A + mv^2)$$

$$\lambda = \frac{2hc}{2A + mv^2}$$

Жауоб :

$$\lambda = 4,97 \cdot 10^{-7} \text{ м.}$$

4. *Graphical issues.* Problems whose object of study consists of graphs of connection of physical quantities are called graphical problems.

In some cases these graphs are given in the condition of the problem, in some cases they need to be summed up.

When solving graphical problems:

Students should have the skills and abilities to "Read" graphs and make simple graphs; work with graphs should be more and more complicated, encouraging students to find quantitative relationships between quantities, to the point of constructing equations.

The steps for solving graphical problems are as follows:

1) if a graph of connections between quantities is given, then it is necessary to explain it, study the description of the connection in each section; 2) using the scale, he should find the quantities (values on the abscissa and ordinate axes) from the graph; 3) if the connection graph is not given, then the graph is drawn according to the values obtained from special tables or from the condition of the problem. For this, coordinate axes are drawn, a certain scale is selected, tables are made, and then corresponding points are placed on the ordinates and abscissas of the plane with the coordinate axes. By connecting these points, a graph of the relationship between the physical quantities is created, which is then studied in the same way as mentioned above [179].

5. *Experimental issues.* When solving experimental problems, experiments must be

conducted in compliance with all the rules. Special attention should be paid to the good visibility of tools and events. It is necessary to lead the process of the experiment by the teacher himself. Here are some examples of demonstration problems.

1. A lever is provided that can rotate around a fixed support. Objects with equal masses but different volumes are hung from both ends of the lever. Richag stands in balance. If objects are immersed in water, it is determined that they are affected by a repulsive force. The magnitude of this force is proportional to the volume of the body and the density of the liquid. Therefore, a smaller body in the water pulls the rod tip more.

This answer is checked in an experiment with the participation of students. The problem can be solved without experimentation, but there is more to lose.

Issue 9. When a 24 Ohm resistor was connected to a battery of galvanic elements, the current in the circuit was 1.5 A, and when a 12 Ohm resistor was connected, the current was 2.7 A. Find the EMF and internal resistance of the battery. If possible, try to do this in practice. For this, use two resistors with known resistances and an ammeter (Fig. 2.6).

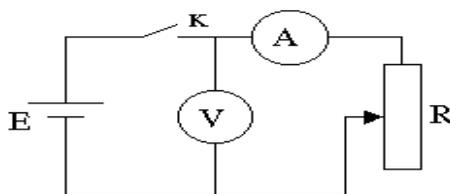


Figure 2.6.

The principle scheme of the assembled electrical circuit.

Given : $R_1 = 24 \text{ Ohm}$; $I_1 = 1.5 \text{ A}$; $R_2 = 12 \text{ Ohm}$; $I_2 = 2,7 \text{ A}$; $\varepsilon = ?$, $\rho = ?$

sequence of solving the problem in the following order helps the student to clearly visualize the physical process taking place in the problem (Fig. 2.7).

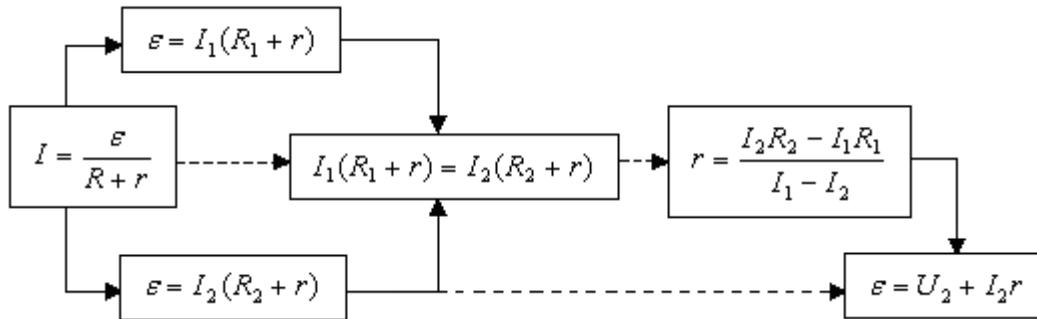


Figure 2.7 - picture. Problem solving algorithm

According to calculations, it can be determined that $e = 27 \text{ V}$, $r = 3 \text{ Ohm}$.

5. Two charges interact in water with a force of 0.3 mN . What F_2 force do they act on organic glass at such a distance? The relative dielectric constant of water is $\epsilon_1 = 81$. Glass $3,3$ rais equal

A) 7.36 mN ; C) 736 mN ; C) 0.736 mN ; D) 73.6 mN ; E) 7630 mN ;

Берилган :

$$F_1 = 0,3 \text{ мН} = 3 \cdot 10^{-4} \text{ Н}$$

$$\epsilon_1 = 81$$

$$\epsilon_2 = 3,3$$

$$F_2 = ?$$

Ечилиши :

$$F_1 = \frac{1}{4\pi\epsilon_1\epsilon_0} \cdot \frac{q_1q_2}{R^2}$$

$$F_2 = \frac{1}{4\pi\epsilon_2\epsilon_0} \cdot \frac{q_1q_2}{R^2}$$

$$\frac{F_1}{F_2} = \frac{\frac{1}{4\pi\epsilon_1\epsilon_0} \cdot \frac{q_1q_2}{R^2}}{\frac{1}{4\pi\epsilon_2\epsilon_0} \cdot \frac{q_1q_2}{R^2}} = \frac{\epsilon_2}{\epsilon_1}$$

$$\frac{F_1}{F_2} = \frac{\epsilon_2}{\epsilon_1} \quad F_1 \cdot \epsilon_1 = F_2 \cdot \epsilon_2 \quad F_2 = \frac{F_1 \cdot \epsilon_1}{\epsilon_2}$$

Хисоблаш :

$$F_2 = \frac{0,3 \cdot 10^{-3} \text{ Н} \cdot 81}{3,3} = 7,36 \cdot 10^{-3} \text{ Н} = 7,36 \text{ мН}$$

Жавоб : $7,36 \text{ Н}$.

6. How many times will the force of interaction change if the charge of positive charges is reduced by 4 times and the distance between them is increased by 2 times.

A) decreases 64 times ; C) increases 64 times; C) increases 4 times; D) decreases by 2 times; E) does not change

Ечилиши :

$$F = k \frac{q_1 q_2}{R^2} = k \frac{4 \cdot 4}{(2R)^2} = k \frac{q_1 q_2}{16 \cdot 4R^2} = k \frac{q_1 q_2}{64R^2}$$

Демак 64 марта камаяди

7. Determine the optical power of a convex lens on both sides, the radii of curvature of the surfaces of which are made of glass with an absolute refractive index of 1.5, respectively, $R_1 * 20$ cm and $R_2 * 40$ cm

A 0,04 cm) V) 0,4 cm; S) 5 cm; D 1,5 cm) E) 3 cm.

Given:

$$n = 1.5$$

$$R_1 = 20 \text{ cm}$$

$$R_2 = 40 \text{ cm}$$

D=?

$$D = (n-1) \left(\frac{1}{R_1} + \frac{1}{R_2} \right)$$

Calculate:

$$D = (1,5 - 1) \left(\frac{R_1 + R_2}{R_1 * R_2} \right) = 0,5 \frac{20 \text{ cm} + 40 \text{ cm}}{20 \text{ cm} * 40 \text{ cm}} = \frac{0,5 * 60}{800} = 0,4 \frac{1}{\text{m}} = 0,4 \text{ дптр}$$

Answer: $D = 0,4 \frac{1}{\text{m}} = 0,4 \text{ дптр}$.

It is important for students to develop their creative abilities, in which the teacher should use all his pedagogical skills, so that the student strives to show himself in every way. According to S. Rubinstein, one of the most important factors in the development of individual students' abilities is the individual's creative independent educational activity [133].

Matters can be divided into two main types:

1) and physical issues ; 2) non-creative issues.

A creative problem encourages the student to think independently, to think logically, and to fully understand the content of the problem.

V.G. According to Razumovsky, an unknown issue for a student is a creative issue. When a student thinks independently in the process of solving a creative problem, they should not separate the problem condition, requirement and solution methods from each other [128]. To solve the problem independently, the student refers to previously solved problems, if he is not satisfied with the exact answers, he looks for a new solution method, which changes the condition of the problem and clarifies the goal. I. Ya. Lerner distinguishes creative problem from non-creative problem in that the student achieves results that are new to him during independent work. As a result, new thinking emerges, he says [95]. Creative - in solving problems, it is necessary to acquire new knowledge in advance.

M. I. According to Makhmutov, every issue solved by independent thinking contains problematic content. From the analysis of the literature, it can be concluded that issues focused on independent thinking are considered creative issues [100]. Special attention should be paid to the selection of interesting issues in order to develop students' independent learning skills and to increase their interest in training. The selected issues should form a clear system and be directed to a specific goal. Therefore, it is necessary to pay special attention to the selection of issues related to certain topics and chapters aimed at forming independent thinking skills. The content of the questions should be derived from the goals and objectives of teaching physics in technical higher education institutions, should be in accordance with the requirements of DTS, the question should be clear and realistic, and the student should have clear scientific knowledge, practical skills and qualifications.

Even when learning materials are learned in a conscious, informal way, the ability to apply knowledge does not appear by itself. This requires special training. Solving physics problems plays an important role in teaching practical application of knowledge. The main goal of solving problems is for students to understand physical laws more deeply, to be able to distinguish them and analyze physical phenomena in them, to be able to apply them to solving practical problems [105].

During the training, it is necessary to clearly plan the study of each topic, the demonstration experiment, laboratory work and other forms of educational activities, as well as by solving problems. When choosing issues, it is necessary to establish a clear system that corresponds to the methodology and meets certain goals of education. Planning prepares for training on certain topics, the teacher selects problems, determines the sequence and consistency of solving them. The selected issues must meet a number of requirements. It is important that the problem gradually becomes more complex from simple, and that the teacher fulfills the intended purpose when choosing each problem. Each of the selected issues will help students to increase their knowledge, deepen their understanding of the connections between the dimensions, and teach them how to apply knowledge in practice. Synthetic and analytical methods should be involved in solving the problem. Analytical method is to divide the issues into simple parts [105]. It is advisable to solve problems in the circle in the following stages:

- I stage. Study the condition of the problem.
- II stage. Study of physical phenomena and processes in matter.
- III stage. Applying laws, formulas, rules describing physical phenomena or processes to solving problems.
- IV stage. Determining the correctness of the appropriate formulas.
- V Stage. Finding the numerical value of the quantity you are looking for.

When teaching students to solve problems, while discussing the content of the problem, great attention should be paid to graphs, tables, diagrams, pictures, drawings, schemes, which will help to solve the problem in full.

Solving problems and getting results. The quantities given in the problem condition may not be given in the same units, it is necessary to bring them to the same system of units.

Conclusions on Chapter II

1. The level of proportionality of traditional and non-traditional classes in physics based on the competence approach, the specific features of the organization of educational activities based on the competence approach were studied and the methodology was developed.

2. The general pedagogical and general methodological aspects of the individual approach to the development of basic competences of students in technical higher education institutions were studied and the necessary recommendations for their implementation were developed.
3. Basic competences were formed for students in technical higher education institutions by solving practical problems in physics, conducting laboratory work and experiments.
4. In the development of professional training of future technical engineers in technical higher education institutions, relevant recommendations were developed on the methodology of solving problems, performing laboratory work, and choosing the methodology of conducting experiments in the science of physics teaching methodology.
5. It was scientifically justified to increase the effectiveness of education of competent engineers by studying the system of subjects taught in foreign countries, by understanding and putting into practice the ideological issues of the studied field based on the competence approach.



UNIT | 3

METHODOLOGY OF TEACHING PHYSICS IN TECHNICAL HIGHER EDUCATION INSTITUTIONS BASED ON THE COMPETENT APPROACH

3.1. Organization of independent educational activities of students based on the competence approach and its effectiveness

Education is carried out in the course of students' educational activities. Such activity is carried out with the help of factors that affect the student's behavior and mental activity, including participation in classes and extracurricular activities, relationships with the teacher and other people, independent work, independent thinking, personal reactions in various situations, among which independent work is of particular importance. is enough. Independent works of students are works performed without the direct participation of the teacher, but based on his ingenuity and research at the appointed time, therefore, together professional competence determines the basis of his qualification improvement.

Independent work methods help to coordinate the educational, educational and developmental tasks of teaching [144, 148].

Independent work educationally serves to repeat, strengthen and deepen theoretical knowledge, practical skills and qualifications. It educates individual qualities such as independence, hard work, and responsibility. It helps the development of independent work, thinking, skills and abilities, trains the individual's will. These methods of teaching give students great importance in their future independent work. Academician Yu.K.Babansky [44, 45, 46] makes the following conclusions about independent work increasing educational efficiency:

It is necessary to expand the use of independent work based on the competence approach in imparting knowledge; when performing independent work, the content of the

educational material should be understandable to students; students' preparation and use of the learning material should be consistent with each other. Even if students do not have sufficient training, the method of independent work should not be abandoned. On the contrary, it is necessary to help students and introduce elements of independent work. It is important to develop cognitive independence in all students, increase the level of independent work from audience to audience [118]. As a result, the educational content and competence approach are important in the formation of basic, general and professional competences in the training of qualified specialists and in the development of professional-pedagogical creativity.

As a result of professional activity, an independent, active, organizational, capable, creative, self-controlled, independent and planned work on himself develops professional knowledge, skills and competencies based on a competent approach to a rich worldview. Basic competences satisfy the needs of a person in life activity in society, which are of actual and prospective importance. Competence-oriented independent education is aimed at purposefully changing the knowledge and practical methods of activities that ensure success in the main field of activities carried out for a person's personal interests, for the interests of society and the state [144, 148].

One should not forget the importance of an individual and differentiated approach to the organization of independent work through a competent approach. For these purposes, it is necessary to use didactic materials prepared in advance and prepared independently with the help of students.

The classification of independent work can cause a number of debates. Regardless of what type they are, independent work is carried out with the help of certain questions and assignments. As a rule, tasks are arranged from simple to complex, and each task is directed to the realization of a certain didactic goal. Separate types of independent work are interrelated and can be combined under certain circumstances [148]. For example, performing physical experiments can be done frontally. In this case, students' activities will have a mobile description. Experiments are conducted in order to strengthen the learned material. It is important to increase the cognitive activity of students when organizing independent work in classes. New knowledge is well perceived only if students

understand the problem and are interested in the work to be done. When setting goals and tasks, it is necessary to take into account the desire of students to be independent, to express themselves and to learn. If conditions are created to satisfy these needs in class and group activities, they will start working with interest. Raising interest in knowledge is a complex issue, and the effectiveness of the classroom and group training process depends on how this issue is addressed [150].

One of the independent learning methods of students is the independent analysis of the stated facts and materials, and the formation of self-awareness competence by students in order to discover the essence of new concepts and activity methods [149].

The research method consists in independent analysis of factual materials, which are presented more than in the form of a teacher's conversation, and in order to organize student activity and an innovative, creative approach to their work in order to discover the essence of new concepts and methods of activity.

The essence of the research method is that the discovery of new laws and regulations is not carried out by the teacher with the participation of students, but under the guidance of the teacher and with his help, the students themselves do it independently. The research method is to describe the educational material in the form of a dialogue:

a) use of some issues and tasks in the presentation of new knowledge; b) asking questions and assignments to analyze and summarize the educational material; c) applying cognitive issues for smaller research, proving conclusions, rejecting misconceptions; g) organization of comprehensive discussions on independent knowledge of topics.

The research method is organized by the teacher mainly by setting the students a highly important theoretical and practical research task. The difference between tasks in the description of research and tasks related to research is that in the research method, students perform work on the collected facts (experiment, observation, work on literature) and their theoretical analysis, systematization and generalization, while discoveries and inventions are the result of the analysis and generalization of factual materials by students appears as [177].

The research method, the student independently performs logical operations and discovers the essence of new concepts and new methods of action. The progress of the student's reasoning, the correctness or incorrectness of the conclusions is determined by the teacher during the conversation with the student or when he reports the result of his research orally or in writing.

In learning based on the research method, factual material is given to the student by the teacher and analyzed together. The student reveals the essence of the new concept with the help of the teacher. The difference between tasks in the description of research and tasks related to knowledge includes the cycle of independent educational-cognitive activities of students from collecting information and analyzing it, from independently posing problems to solving them, checking solutions and applying new knowledge in practice [166].

Students should have the steps to observe, collect and analyze material, explain and apply the laws and rules they discover, as in research. One of the features of the tasks in the description of the research is the analysis of the initially collected materials.

Research works can be different according to the forms of organization. Student experience; participation in scientific experiments; excursion; study archives; preparing lectures, reading them in the presence of students [43].

It ensures that students have good control over their independent activities, provides an opportunity to perfectly manage the mastering process and increase its speed. Facilitates the process of individualization of education at the stage of acquiring new knowledge. This will prevent the students from being left behind . Due to the widespread use of such educational methodological developments in programmed education, this method is promising [161].

Currently, special attention is paid to the development of independent educational activities of students. The development of independent educational activities of students in physics is important in increasing the effectiveness of physics teaching. Therefore, it

is necessary to determine the types and forms of independent work aimed at developing the independent activity of students [164].

The first type of independent work of students in the audience is to study questions that are not fully covered when the teacher explains the topic.

The second type consists of independent repetition of all materials presented by the teacher in the classroom and strengthening of knowledge. When the teacher explains the topic, he gives the questions that are not covered as homework for independent study.

The third type is learning and acquisition of previously unacquired knowledge in new logical relationships.

The fourth type is to acquire new knowledge by organizing independent learning activities during the training, rather than making it a task for independent study at home.

The fifth type is the teacher's explanation and reinforcement of knowledge acquired from other sources along the way.

I.I.Malkin [26], he divides the organization of independent educational activities into four types [26]. These four types are divided into 13 types, and it is assumed that the teacher uses them creatively in organizing the educational process.

These are the following:

1. Independent work of the **recall** type, which uses previously learned knowledge. There are 4 types of educational activities: recalling, that is, remembering and activating previously acquired knowledge without changing it; practicing, that is, recalling the learned material in the process of practical application, using the learned concepts in new situations; independent works in the form of checks, which perform the function of feedback and improve and strengthen them in the process of acquiring new knowledge; exercises on the systematization and

arrangement of previously studied materials.

2. **Knowing is** an independent educational activity of research type. During such activities, students independently acquire new knowledge, such activities can be divided into 2 types: logical research activities related to the performance of tasks in acquiring new knowledge, improvement and deepening of previously acquired knowledge. Such activity requires various logical operations: analysis and synthesis, comparison of facts and events, identification of similarities and differences, separation of primary and secondary characters, revealing cause and effect relationships, etc. Studying new facts and phenomena in materials collected during useful work during the observation of natural phenomena and social life.
3. **Knowing** - independent educational activity of a practical type: experimental research in physics. Such activities are aimed at expanding the connection of education with life and production . During such activities, students acquire new knowledge based on experiences that require reasoned inferences and generalizations. These will take the form of: practical research papers in physics. Acquires new knowledge based on experience . Technical creative work: making tools, models, simple technical inventions, designing and constructing simple layouts, making proposals for equipping classrooms and laboratories; theoretical-practical works: independently create and solve problems, graphs, diagrams based on materials collected from life; social-practical independent work related to participation in productive work, for example, repair of simple electrical devices, electrification of objects, etc. [26].
4. **Independent educational activity of creative type.** Students create something new with the power of thinking and active imagination, drawing on the rich concepts and connections gathered from reading and life experiences, as well as the methods of action. Such creative activity can be divided into three types: artistic activity. In this, students represent existence figuratively. He reacts emotionally to facts and events. For example, writing a fictional essay or essay about being on interplanetary space travel ; scientific-creative activity performed according to the teacher's assignment. Such independent activity is formed taking into account the individual and age characteristics of the student. The following methods can be used in the formation of independent educational activities of students in physics:

1) the method of assigning tasks related to research (heuristic); 2) research method; 3) method of programmed tasks; 4) method of providing information; 5) execution method; 6) descriptive-illustrative method of education; 7) recall method; 8) practical method of education; 9) incentive method; 10) research method [26].

The characteristics that are the basis for the classification of independent works are as follows and they can be classified as follows:

- I. Independent work conducted according to the didactic purpose of the training: repetition and generalization of previously acquired basic knowledge ; learning new material; systematization of knowledge; strengthening knowledge, skills and competences by performing repetition exercises; applying knowledge in a new situation; examination and control of students' knowledge, skills and competences.
- II. According to the description of the organization of students' independent cognitive activities: extract descriptive independent works performed according to a summary; independent works with a partially exploratory description; independent works in the description of a task (scientific research) .
- III. According to the form of organization of students' independent activities: independent works organized in a frontal (whole) manner ; independent work organized as a group; independent works organized in an individual-classified manner [144 , 147] .
- IV. According to the source of knowledge and teaching tools : independent work with textbooks and other educational manuals; making an independent plan and outline of the lecture based on the read text; independent work with handouts; independent work on performing physical experiments; by creating models independently ; independently solve problems related to quality and calculation orally and in writing; by writing dictations ; by solving experimental problems; by performing graphic works; by preparing lectures and abstracts; by independently solving test tasks; work with puzzles and assignments from physics ; by involving students to independently compose questions and test options [30] .

In order to increase students' interest in knowledge, it was considered important to gradually raise students from the level of simple knowledge to the level of scientific

understanding and drawing conclusions by teaching them to see novelty in familiar things. Interest in knowledge is awakened when talking about the history of scientific discoveries, the struggle of ideas, the work of scientists and the use of devices in life. The educational material in the physics course provides such opportunities that the activation of the teaching process is achieved by using various independent works organized according to the characteristics of student interests and specific educational goals.

Taking into account the importance of students' interest in learning from the beginning of the lesson, the teacher thinks of different methods of interest. The most important of them are related to 3 situations: firstly, focusing students' attention on the purpose and tasks of training ; secondly, to arouse interest in the content of the repeated and newly studied material; thirdly, to organize the form of activity that is interesting for students. It was observed that the active perception of the new material occurs during the sessions where the problems related to the formation of students' physical thinking are discussed. In this pedagogical situation, a research environment is created, in which the student tries to solve the problems set before him more actively [60].

In order for a teacher to be able to organize the educational process, it is not enough to have a good knowledge of the theory and practice of the fundamentals of physics and the methodology of teaching physics. It is necessary for the teacher to know the process of teaching and the psychological laws of acquiring physical knowledge, the development of skills and abilities, and the teaching of thinking, especially independent thinking.

One of the important tasks of teaching physics is the problem of developing students' mental abilities, for which the teacher should know mental operations such as analysis, synthesis, comparison, abstraction, clarification and generalization, which are considered components of mental development and methods of mental activity, and the connections between them, pay serious attention to the mastery of such mental operations by students should focus.

Physics lessons and extracurricular activities: the speed of assimilation of educational material; the meaningfulness of thinking determined by the number of opinions ;

students' ability to think analytically and synthetically; to be able to transfer the methods of mental activity formed on the basis of studying one object to other similar cases; independent systematization and generalization of acquired knowledge.

Taking into account and implementing the above-mentioned features serves the formation of actions and operations, i.e. activities, in students, such as analysis, comparison, identification of general, specific and special features, abstraction, generalization, synthesis. It is important to motivate studying in the classroom and outside the classroom, and to develop interest in studying physics. In psychology, motivation means the reasons that motivate students to certain activities and actions. The formation of motives is influenced by requirements and instincts, norms and emotions, attitudes, ideas and interests. Study motivations can take different forms [129]:

The task of the teacher is to instill in his students higher motives - to be useful to society, to educate the belief in the need to acquire knowledge, to educate a sense of interest in learning science. Interest in learning, striving for knowledge is one of the motivations leading the student.

Aspects of students' interest in knowledge have been studied by many scientists. Interest in learning determines the student's positive attitude to study in general and to learning some subjects. If the teacher is able to arouse interest in his subject in the student, then an opportunity is created for the creative independent work of the student, they strive for knowledge, that is, to overcome various difficulties on the way to its acquisition.

Systematization refers to the activity of thinking. Based on the selected principle, the studied objects are placed in a certain order. The use of systematization not only organizes human knowledge about objects of knowledge, but also serves as a source of new knowledge. The system of information fragments that describes the mental development of a person determines the restoration of certain components of his knowledge, that is, his creative ability [114].

In the course of physics, guided, systematized objects include:

1) forming the structure of matter; 2) properties of bodies (particles); 3) events, processes, types of actions; 4) tools, machines, devices; 5) inspection methods; 6) it is possible to introduce quantities that move physical properties and phenomena, etc. As an example of classification using schemes, it is possible to classify power plants according to the conversion of various forms of energy into mechanical energy (Fig. 3.1), depending on the level of complexity of substances studied in physics, according to the types of interaction (Fig. 3.2). It is possible to distinguish the main components of the body's internal energy (Fig. 3.3). On this basis, students systematize the concepts of kinematics and dynamics.

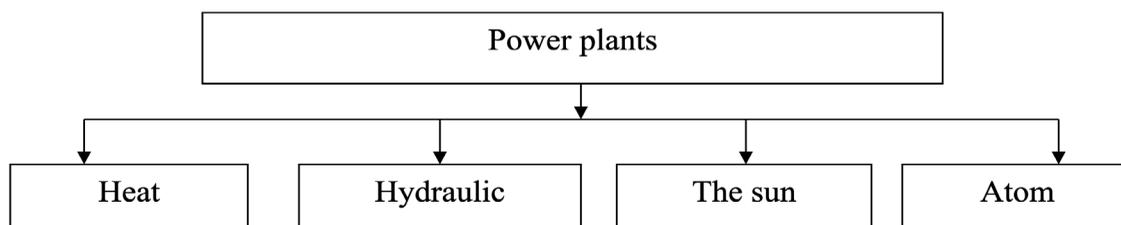


Figure 3.1. Types of power plants.

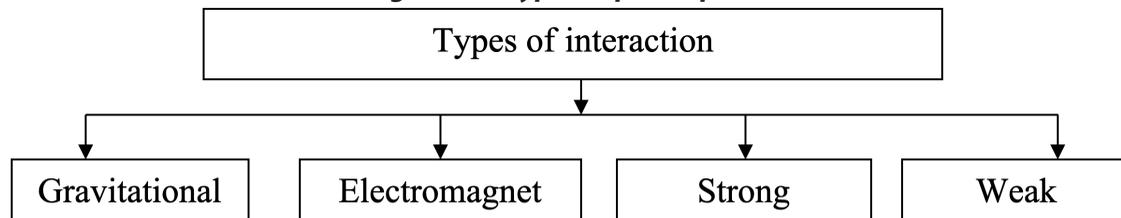


Figure 3.2. Interactions in nature.

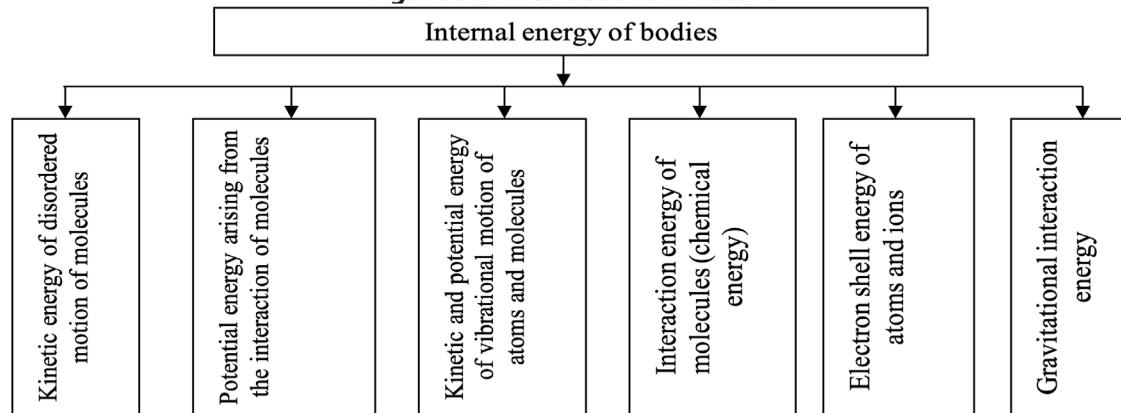


Figure 3.3. Organizers of internal energy.

Empirical and theoretical types of thinking are distinguished in modern psychology: Empirical thinking relies on direct perception, emotional images and imaginations, and does not go beyond the stage of abstract imagination and is limited to determining the formation of empirical concepts. Theoretical thinking is based on the acceptance of a fixed solution, but it goes beyond its limits and reaches the level of generalization, which is not given in direct acceptance. Theoretical concepts are the creation of hypotheses and theories of mental models. It is possible to formulate new phenomena as a result of the theory of laws, based on the general theory, as a means of drawing conclusions by the method of theoretical thinking.

Scientific thinking is more theoretical thinking. In the process of teaching physics, it is necessary to educate and develop theoretical and practical thinking in students based on theoretical conclusion and generalization. In this case, for scientific thinking: clearly express the purpose of the research; developing a hypothesis based on previously performed theoretical or experimental research; research methodology development; determining the main stages of research; conducting private research according to the developed methodology and plan; analysis of the obtained results [86].

The second way is to involve students in solving problems, defining a hypothesis, searching for ways to solve problems, developing a plan of investigations, and developing an investigation methodology.

The third way is to involve those who are interested in determining causal relationships, working with ideal models in explaining observed phenomena and physical properties. The fourth way is to draw conclusions by induction and deduction.

The induction method is used more often in the study of students of the 1st stage . Even so, it is necessary to gradually involve students in drawing conclusions by the deduction method. In particular, the basic concepts of mechanics and electrical concepts are studied.

Creative activity is the highest level of independent activity. To develop creative activity, it is necessary to develop creative ability.

For example, a question in the form of research. The puck rests on the edge of a horizontal disc. The disk was rotated so that the angular velocity gradually increased. There comes a time when the puck slips out. The question in terms of design is how to convert a voltmeter to an ohmmeter? Draw a diagram. Let the calculations be done and the instrument assembled.

The description of the pedagogical relationship of the teacher and students during the teaching process has a great influence on the development of creative ability. It is recommended to use the question-answer, discussion conversation and problem method when explaining new material in the training. In such conversations, a teacher-organized dispute-discussion arises among the students, and different views face each other. Creating a conflict requires a lot of work and skill, the result of which justifies the labor spent [117].

Educational conferences and seminars are useful for developing creative abilities. In training seminars - situations where common interests and disputes arise are good results of working as a team. Take, for example, a seminar on electricity production, transmission and utilization. The content of independent study sessions can be approached from the point of view of developing students' creative activity. In this case, students are not given new knowledge, but because of this, students are encouraged to acquire independent knowledge in new conditions, in the process of interesting work on independent verification, and a system of exercises in creative description is given. The use of creative problems is also an effective method [112].

The effectiveness of the educational process is determined by the teacher's efforts to activate the independent activity of students. The main task is to educate students' aspiration, inquisitiveness, ingenuity, qualities, organize and form independent educational activities. If the student actively listens to the teacher, performs homework and other assignments in an exemplary manner, studies an independent textbook and other additional literature, and participates in science circles, such an educational process is actively organized. If the teacher explains the topics in an understandable and simple way during the training and outside of the training, uses demonstration and technical means of education, innovative methods, takes into account the individual

characteristics of the students, and organizes the educational process based on the principle of individual and differentiated education, the educational results will be effective [144].

In the physics lessons, students can organize independent educational activities in the following directions: independent study of the text on the subject in the lesson; independent performance of subject-related exercises; solving experimental and computational problems; solving test tasks independently; conducting experiments and observations; work with tables, pictures, graphs, electrical circuits; work with visual aids and other educational tools; computer-aided study of subject-related material; completing physical puzzles, riddles and various individual tasks, tasks, etc. [148].

Regardless of the type, independent work is carried out with the help of certain questions and tasks. Tasks are oriented from simple to complex, and each task has a specific didactic purpose. Separate types of independent work are closely related to each other, and under certain conditions they can be combined. For example, the performance of physical experiments can be carried out in a frontal way, in which the activity of students will have an abstract description. Experiments are conducted in order to strengthen the learned material.

The teacher considers various aspects of the methodology, taking into account the importance of generating interest in knowledge from the beginning of the lesson. The most important of them are related to 3 situations: firstly, focusing students' attention on the purpose and tasks of training; secondly, to arouse interest in the content of the repeated and newly studied material; thirdly, to ensure that students engage in a form of work that is interesting to them [175].

In the active perception of new material, problems related to the formation of physical thinking of students take place during the sessions. In this pedagogic situation, an atmosphere of research is created, in which students begin to more actively solve the problems set before them. Repetition of the learned material can also be the basis for developing and strengthening interest in knowledge and attract attention to the most important issues of the studied material [95].

Students' work is active only when they are ready to perform the actions required to complete the task. Mastering concepts is a more complex activity. For this, it is required to correctly apply comparison, transfer, abstract, apply analogy and determine the important qualities of other concepts. Working with textbooks plays an important role in students' independent learning activities. In order to develop the ability to use the method of independent work with the book, it is very important for students to work regularly with the textbook [176].

In lectures-interviews, relatively good conditions are created for creative learning of the academic subject: the traditional homework checking, student control and knowledge assessment actions are not performed, but students' attention is drawn to listening to the lecture and an opportunity is created to explain intermediate questions of the topic in depth. In this case, the importance of independent work for students increases dramatically, during a seminar or practical training, a lot of time is allocated to perform various types of independent work, debate and discussion.

Seminar classes are considered an active form of students' independent work. It is in these trainings that it is possible to fully consciously implement the "teacher-student" interdependence, to achieve the students' conscious acquisition of the learned material, and answers to incomprehensible questions. In a number of cases, there is a debate in the auditorium, where students argue among themselves and convince others of the ideas presented. All this expands the knowledge of students [22].

There is an opportunity to observe the independent work of the students and evaluate their activities of mastering and working with additional literature. Advice will be given before the seminar. In this, the teacher is this type of training and provides insights into the requirements of preparing for it.

In teaching students, a comprehensive lecture-seminar the issues of introducing the system are sufficiently disclosed in the scientific and methodical literature.

N.P. Guzik skillfully combines lecture-seminar methods with other teaching methods [63]. His system of work includes the following five types of training: 1. Lecture -

instructional training. 2. Intensive seminar sessions where individual work of students is carried out on the educational material. 3. Generalization and systematization of knowledge conducted in the form of tests on previously studied topics. 4. Interdisciplinary generalization of the material. 5. Training in the form of practical training.

Such a work system allows the main part of the study to be spent in the training itself, thereby excluding the traditional reproductive homework and replacing them with creative independent work. This system activates the process of independent work of all students in the classroom and helps them to develop as much as possible. Such methods of work help students to cooperate in the learning process. Students are given a separate time to repeat the learning material of the subject to be mastered several times in order to present it in different contexts and in different ways. All this helps students to fully and deeply master the educational material.

Demonstration experiments are conducted at first, when students are not familiar with the subject and phenomena to be studied in advance and are not ready to observe. At such a time, the teacher not only shows the subject to be studied, but also arranges to observe it. Learning experiences performed by students are a type of independent work. In this case, students' independent work consists of laboratory experiments, practical exercises and solving experimental problems aimed at learning a new topic, checking and strengthening it.

Laboratory experiments are more often used in teaching new educational material. In this, the skills and qualifications of students in acquiring the skills and methods of conducting physical experiments will increase.

Practical trainings are carried out independently by the students after the completion of some topics, they are held after the completion of the topic to strengthen and improve knowledge, to clarify, and to form practical skills.

In higher courses, after the students have acquired the appropriate qualifications, the role of the teacher is limited to general guidance. Students' independence in performing practical exercises and solving experimental problems increases.

The most important psychological and pedagogical problem in the teaching of physical science is to develop creative thinking of students, to develop their mental abilities, to use active methods of teaching, non-traditional forms and methods of education and training on a large scale, to study bodies and phenomena based on their interrelationship, movement and development. In this, especially, increasing the activity of students ensures that they acquire new knowledge. Education aimed at the development of the student's personality implies the organization of a pedagogical environment adapted to the personal capabilities of the student and the educational process [64].

The methodical solution of these issues creates the need to develop a model that connects them, that is, the development of competencies in students. Focusing on the above educational technologies to educate students as specialists of their profession based on the competence approach, it is possible to conclude on the basis of the following model (Fig. 3.4).

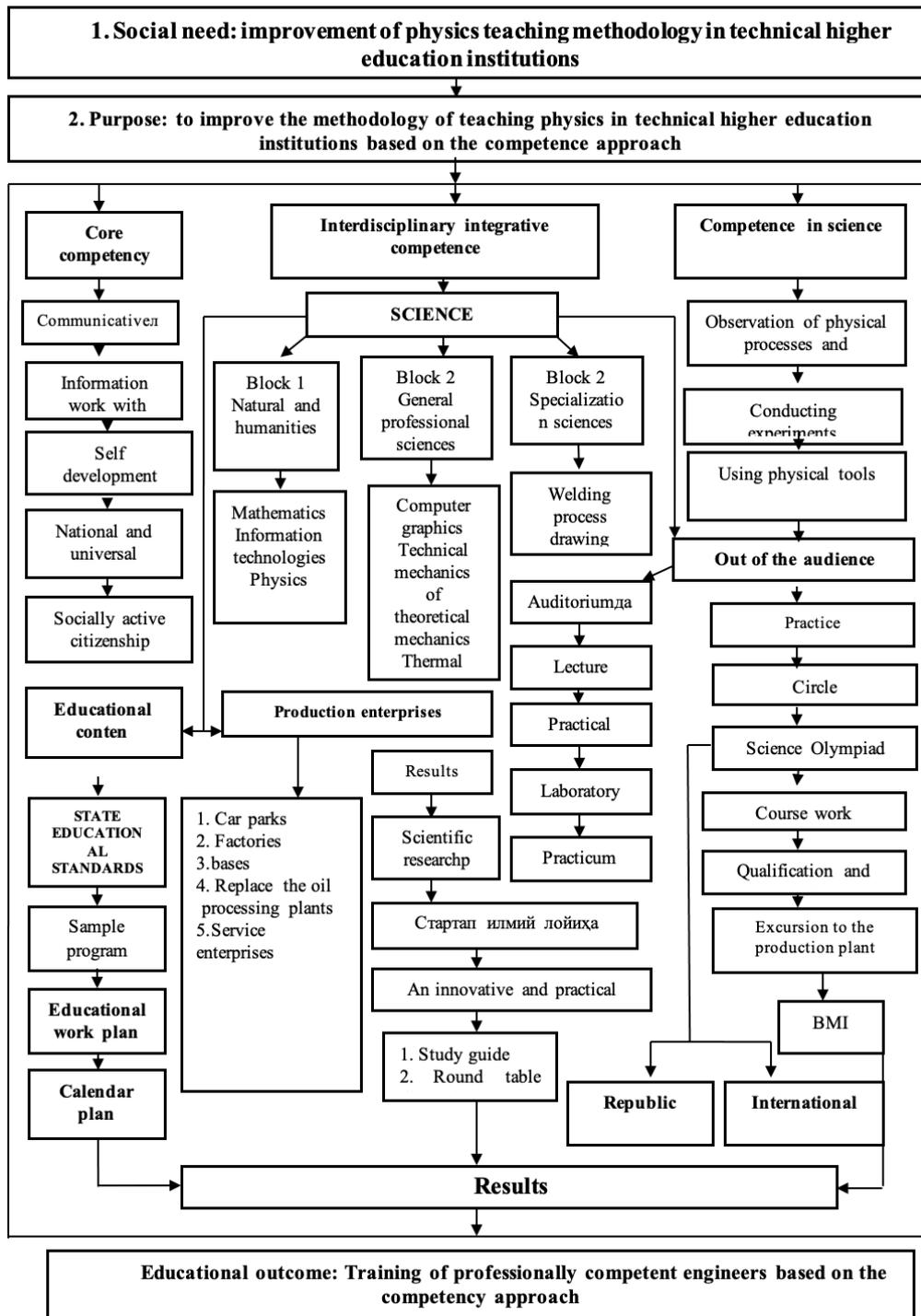


Figure 3.4. Model of training of technical engineers in technical higher education institutions

Work outside the auditorium can be organized in the following forms: individually: reading textbooks, study guides and additional literature, magazines; preparing abstracts and solving problems; participation in external Olympiads; performing experimental tasks at home; making hand tools; in groups: physics circles; physics and engineering circle; technical circle; scientific research group; excursion; public: physics Olympiads, quizzes; physical decade; nights; selection of newspapers.

This model mainly serves to reveal the pedagogical process and result, and the effective organization of the process of improving the physics teaching methodology based on the competence approach in technical higher education institutions is interrelated with the selected approaches and conditions.

3.2. Methodology of using educational technologies in the development of students' competence

A person's belonging to the human race is expressed by the concept of an individual. Only a person who engages in social relations and actively participates in social development is called a person. A person born as an individual later becomes a person. For a person to be a person, he must also have activity. Because activity during activity is an important sign of personality. Activity is always directed towards living well. The activity that a person shows for a good life and development of society is a sign of a person's consciousness.

Individuality is seen in a person's unique characteristics, feelings and motives of activity. Accordingly, people differ from each other [161].

Pedagogical scientists recommend that the following be taken into account by the teacher in the implementation of person-oriented education:

1. Treat every student as a great person, respect him, understand him, accept him, trust him.
2. It is necessary to create such an environment of education in which the student feels that he is a person, that he feels attention to him.
3. Not to conduct a test and not to exaggerate its deficiency; to identify the reasons for

not learning, misbehaving and eliminating them in a way that does not harm the student's personality.

4. To create an "atmosphere of success" in education, to help the student succeed in studying, to gain confidence in his own strength and talent.

To convey to the student that everyone around him is a person like himself, to develop a sense of belonging to the team. Teaching based on student capabilities. Most of the teachers state that the different level of mastery of the students in their groups creates problems in their teaching. Such groups are described as follows. Some students easily grasp the material in class, answer questions, and do well on tests. Other students will lag behind, struggle to understand, and perform poorly on tests. Some students are able to work cooperatively, sit with interest in the lesson; meanwhile, other students are not paying attention to the training. Teachers worry that they are not able to motivate high achieving students in time and help those who are lagging behind [117].

Each pedagogue should take into account the psychological characteristics of students in the process of education and, if necessary, draw up a work plan accordingly.

Methods of individual approach to students. It is known that the effectiveness of teaching is higher when the student is approached individually. Below are the methods of individual approach to students by teachers [161]:

Method 1. Work in pairs. A strong student can be paired with a strong one, a low-achieving student with a similar student, or a high-achieving and a low-achieving student can be paired together . Don't be surprised by the friendship that develops. In this case, it is necessary to pay attention to the relationship between students of different abilities in the group.

Method 2. Work in small groups. Groups can be of the same or different levels. If groups are working on a set of data, each group is given a different piece of information and directed to work together.

Method 3. Differentiation of duties. This method consists in developing different tasks

for students with different levels of mastery. For example, two types of questions can be created on the same topic. All students will work on the first type of questions, strong students will also need to work on the second type of questions. Questions can be written on the board, ranging from easy to difficult.

Method 4. Extra work or duty. Students are given different levels of homework. Students who learn slowly can be given an additional task in order to strengthen the topic covered in the lesson. Strong students are given additional tasks that expand their knowledge, skills and abilities, and require a creative approach.

Method 5. Say the names of the students. It is possible to draw students' attention to the lesson through the method of asking questions by naming students. For example, if "What is the answer to question number three?" it remains an open question. Before asking, it is necessary to think whether the student can answer the question or not. Embarrassment of students should be avoided. It is better to ask stronger students for more difficult questions and others for easier questions. It is appropriate to ask a question first and then say the student's name. Then everyone listens to the question [161].

Method 6. Teaching small groups. If some students in the group need help, try to teach them in small groups while the group is doing some written work.

Method 7. Additional education groups. In some countries of the world, additional educational groups for students with low mastery have been organized in higher education institutions after training. In these groups, work is carried out by teachers or students of the upper audience.

Method 8. Mentoring programs. Some countries around the world have mentoring programs to help struggling students. In conclusion, it is possible to successfully form and develop competences by organizing the educational process by giving students the opportunity to gain experiences that require the involvement of different types of intelligence, by using various forms of visual aids and didactic tools, taking into account the categories of information reception of students during the training process. Technologies based on the activation of students are also different, and one of them is

used as an example of the pedagogue's skills according to the purpose of the training and the educational content [166].

1. Game technologies. 2. Problem-based education. 3. Design technology. 4. Interactive educational technologies. 5. Training technologies.

Game technologies. Taking into account the psychological characteristics of the student, their tendency to play, it is appropriate to use the method they like. This method is effective in forming and developing student competencies. In education, games perform the following functions: communicative: to master the dialectic of communication; to express oneself in the game; play therapy: to overcome various difficulties that arise in various aspects of life; to diagnose: determine whether behavior deviates from the norm; correction: to make positive changes to personal indicators, etc. The structure of the game includes goal setting, planning, goal implementation, and analysis of results as activities. The motivation of game activity occurs due to its voluntariness, the possibility of choice and the presence of elements of competition, it shows its identity [30].

In technical higher education institutions, game activity is used in the following cases: as an independent technology in mastering a concept, topic, and even a section of an academic subject; as training technology or its fragment (introduction, explanation, strengthening, training, control); as works outside the audience [30].

Game technology can be implemented in three different directions: students are given a didactic goal in the form of a game problem; educational activity is subject to the rules of the game; educational material is used as its tool, and an element of competition is introduced into the educational activity. The successful completion of the didactic problem is connected with the result of the game.

In the process of problem-based education, a certain learning problem is set under the guidance of the teacher, and students are given the task of solving it. In this case, the social activity of students increases, they engage in mutual communication, and in the search for a solution to the problem, the knowledge, skills, and competence of science increase, and the competencies of using mathematical literacy and scientific-

technical achievements are formed [132]. In the field of physics, problem training can be organized according to:

1. The solution of a scientific problem, that is, in theoretical research, educational problems that require proof of a new rule, law, are solved.
2. Practical educational problems such as the solution of a practical problem, that is, the application of certain knowledge in a new situation, the creation of constructions, and inventions are solved.

The level of demand of physics today depends on the development of technology, its role in the field of production and everyday life, the formation and growth of students' scientific worldview, ability to think logically, mental development, self-awareness potential, the formation of necessary competencies during their education and professional activity and development is determined by their ability to apply the knowledge they have acquired today. Physical science DTS, like other academic subjects, is based on education focused on the formation and development of students' basic and science-related competencies. Educational requirements aimed at forming basic and subject-related competences in students arise from the need of students to be academic (practical).

Educational games fulfill the tasks of developing and strengthening students' independent work skills, creative thinking ability and team management, decision-making and analysis of its implementation. During the game, the following skills, qualifications and competencies are formed: decision-making, collection and analysis of necessary information; decision-making in conditions of incomplete and insufficient reliable information; analysis of certain types of issues; working in a team, using the methods of group thinking, developing a jointly agreed solution; creative use of a systems approach in process and phenomenon research [154].

It is necessary to introduce the functions of organizational and communicative qualities, self-assessment functions in the creative solution of professional issues, which can be used for the functionalization of the game teaching method and the development of various psychological characteristics and qualities of a person, professional orientation, mental independence, knowledge, skills, competencies in this or that field of activity.

Formation and development of competence in students is a powerful means of interest in the content of activities. Inquisitiveness in students makes it possible to develop research methodology. Problem setting is manifested in the priority of individual qualities over finding a solution as a group.

The effectiveness of the game as a teaching method is more dependent on the material and technical support, which includes special equipment for the game, computer technology and the number of participants.

Another problem is the objective evaluation of each player and the discussion of the conclusion is important. During didactic games, students get a positive feeling of excitement that keeps them from getting tired. It increases their intellectual ability [129].

Although the general issues of using didactic games in the process of teaching physics are widely covered in the scientific-methodical literature, the main focus is on problem solving and laws. However, it is natural that mastering the science of physics is more difficult for students and non-traditional approaches are required to solve some of its problems. There are a number of scientific-theoretical, methodological and didactic reasons for this, which any skilled physics teacher cannot ignore.

Therefore, it is necessary to use new pedagogical technologies, non-traditional methods and forms in teaching physics. In particular, didactic games help students to use their abilities of independent thinking, ingenuity, inquisitiveness, promptness, draw logical conclusions, compare known and unknown aspects, work on themselves, observe based on existing knowledge, and realize the competence of self-development as a person [130].

In this chapter, we present examples of didactic games in class training and circle training in the direction of organizing students' independent work in the process of learning physics [30]. To achieve a high score in these didactic games, it is advisable to use textbooks and additional literature.

Physics vocabulary game.

The teacher writes one letter on the board, and the students write in their notebooks the physical term, physical quantity, physical instruments, units of measurement, etc., that begin with that letter. Then which student says how many phrases he wrote. The teacher goes around checking, the student who wrote the most gets the first place. Then the words found by that student, the words that are not found by the students who are behind, are written on the board, and all students copy the words that they did not find on the board. For example, the letter T includes words such as speed, sound, nature, brake, vibration, temperature, thermodynamics, Thomson, Tesla, thermonuclear, accelerator, tachometer, gravity, transistor, transuranium, turbulent, smoke, wave, linearly accelerated, linearly decelerated.

Accelerometer, amorphous, atom, Avogadro, acoustic, alpha, antimatter, atmosphere, astrophysics, aluminum, adiabatic, eternal, base, angstrom, aneroid, areometer, ammeter, absolute elongation, amorphous, anisotropic, circle, etc.

According to physical formulas The domino game goes like this: $v = \frac{s}{t}$ Ⓢ

$$t = \frac{s}{v} \text{ Ⓢ } v = v_0 + at \text{ Ⓢ } t = \frac{v - v_0}{a} \text{ Ⓢ } a = \frac{v^2 - v_0^2}{2s} \text{ Ⓢ } s = v_0t + \frac{at^2}{2} \text{ Ⓢ } t = \frac{A}{N} \text{ Ⓢ } N = \frac{A}{t}$$

$$t = \frac{A}{IU} \rightarrow U = IR \rightarrow R = \rho \frac{l}{s} \rightarrow S = \frac{F}{p} \rightarrow p = nkT \rightarrow T = \frac{2E_k}{3k} \rightarrow k = \frac{R}{N_A} \rightarrow N_A = \frac{N}{v} \rightarrow v = \frac{m}{\mu} \rightarrow \mu = m_b N_A \rightarrow$$

$$\rightarrow N_A = \frac{NRT}{PV} \rightarrow T = \frac{p}{nk} \rightarrow k = \frac{2E_k}{3T} \rightarrow T = \frac{p}{nk}; n = \frac{N}{V} \rightarrow V = \frac{m}{\rho} \rightarrow \rho = \frac{m}{V} \rightarrow V = Sh.$$

made up of physical terms.

Speed → strength → frequency → atom → mass → a ngstrom → meteor → lever → hygrometer → rheostat → scales → job → sho q ul → liter → radium → companion → Charles → Lomonosov → time → Thomson → Newton → n anometer → radius → second will be continued in order. In the domino game consisting of physical words, the teacher says the first word and writes it on the board, continuing with physical terms from the last letter.

"Physical Linguistics" deals with the laws of language and the charms of speech. The

language of physics is rich, appropriate use of its possibilities can serve to increase the level of knowledge of students. Puzzles related to various physical quantities, laws, and units teach students to be eloquent, resourceful, and present. First of all, this event encourages them to work independently, gain additional knowledge, and use the written and spoken language opportunities of physics [121]. will remember for a long time that it is one of the natural sciences.

We have provided examples of didactic games in classroom and extracurricular activities. It is required to find both the meaning and the answer to the riddle.

Task 1: 1. Bodies travel equal distances in equal times. 2. The distance from the point where the line of action of the force is placed to the axis of rotation. 3. The mass of a substance in a unit volume. 4. One of the units of measurement of volume. 5. Multiplication of the force acting on the body by the displacement distance under the influence of this force. 6. Energy generated by bodies due to their movement. By placing the first letter of the definitions in the cells, a physical quantity called speed is derived (see Table 3.1).

Table 3.1 Physical password

1	2	3	4	5	6
T	E	Z	L	I	K

Answer: 1. Smooth movement. 2. Shoulder. 3. Density. 4. Литр. 5. Work. 6. Kinetic energy.

Task 2: Finding the correct answers to the following questions and placing their initials in the empty cells will result in a wise word that will remind students for a long time that physics is one of the powerful natural sciences (see Table 3.2).

Table 3.2 Physical linguistics

1	2	3	4	5	6	7	8	9	10
F	I	Z	I	K	A	F	A	N	I
11	12		13	14	15	16	17	18	19

M	U	'	J	I	Z	A	L	A	R
20	21	22	23	24	25	26			
M	A	Y	D	O	N	I			

- To bodies composed of different substances is said to be _____.
- A body can move in such a way that the straight line connecting two arbitrary points of it remains parallel to itself even when the body moves, it is called _____ h motion.
- The mass of the substance per unit volume is _____ is called
- A body's speed does not change after the impact of another body on it is called _____.
- The effect of one body on another body _____ is called
- An instrument that measures acceleration is _____.
- An expression consisting of a quantitative relationship between quantities describing events is called _____.
- A body immersed in a liquid compresses a liquid of the same weight as its volume, and it is acted upon by a force of this magnitude,
- Unit of force _____
- The amount of energy given to a body as a result of heat exchange is called _____.
- The physical quantity describing the inertia of bodies is _____
- The _____ optic passing through the center of the lens is called _____.
- The father of Russian aviation _____
- The chaotic motion of the molecules that make up the body and the sum of the interaction energies of the molecules is called _____.
- kg / m³ q is the unit of physical quantity ?
- A device that measures density _____
- The unit of measurement of volume is _____
- Thrust acting on a body immersed in a liquid or gas output power _____
- A body that can rotate around a fixed support _____
- One of the optical instruments _____
- A body that is both liquid and solid _____

22. The quantity equal to the length of the trajectory is _____
23. The change in shape and size of an object under the influence of force is called _____.
24. The speed of the trajectory at a certain time and at a certain point is called _____ speed.
25. 1 кrthe unit of force that can give a mass body an acceleration of 1 m/s^2 __ __
26. Formed when one body slides on the surface of another body and the force opposite to the motion is called _____.

Answers :

1. Physical body. 2. Progressive action. 3. Density. 4. Inertia. 5. Strength. 6. Accelerometer. 7. Physical law. 8. Archimedean force. 9. Newton. 10. Amount of heat. 11. Mass. 12. Arrow. 13. Zhukovsky. 14. Internal energy. 15. Density. 16. Hydrometer. 17. Литр. 18. Archimedean force. 19. Richag. 20. Microscope. 21. Amorphous. 22. Road. 23. Deformation . 24. Instantaneous speed . 25 . Newton. 26. The force of friction.

In order to get information about the scientists who discovered the laws in the field of physics, we found it permissible to recommend students to solve the following puzzle independently (Table 3.21). Students should find answers to the following questions:

1. The scientist who determined the laws of motion. 2. Scientist who discovered atmospheric pressure. 3. The scientist who introduced the concept of electric field to science. 4. The scientist who determined the structure of the atom. 5. One of the founders of the molecular-kinetic theory. 6. Scientist who founded quantum physics. 7. The scientist who discovered the magnetic field of current. 8. The scientist who discovered the law of conservation and circulation of energy, the quantitative relationship between the speed of liquid flow and its pressure. 9. A scientist who conducted an experiment confirming the connection of a magnetic field with moving charges. 10. The scientist who discovered the phenomenon of photo effect in 1887. 11. The scientist who created the heliocentric system. 12. The scientist who discovered the neutron, which is part of the atomic nucleus. 13. A scientist who determined that the pressure exerted on a liquid or gas in a closed container under external forces is distributed uniformly in all directions. 14. The scientist who determined the unit of loudness. 15. The founder of

the X-ray tube. 16. A scientist who determined in his works that matter is composed of small particles [28].

Completing the puzzle uses numbers and pointers. The index placed in front of the numbers indicates the initial direction in determining the answer, that is, the first two or three letters of the scientist's name. The student himself chooses the direction in identifying the remaining letters. In the following cases, the direction can be changed to up, down, right and left. For example, to determine the answer to the fourth question, the pointer moves two cells to the right, identifying the letters **R** and **E**, and then the student chooses the remaining directions to form the word Rutherford [167] (see Table 3.3).

Table 3.3 A puzzle to provide information about physicists.

1 →	N	Yu	3 →	F	A	D	E	Y	7 →	E
6 ↓	2 →	T	O	N	R	A	4 →	R	E	R
E	Y	N	R	I	Ch	E	L	E	Z	S
5 →	B	Sh	T	E	Y	N	L	I	E	T
8 ↓	O	L	Ts	M	A	N	A	B	R	E
B	E	R	I	L	9 →	E	Y	V	F	D
10 →	G	N	U	L	12 →	Ch	X	G	O	13 ↓
11 ↓	E	R	S	L	E	E	E	D	R	P
K	E	P	R	N	B	D	N	O	D	A
14 →	A	L	E	K	R	V	V	A	L	S
15 →	R	E	N	S	D	I	K	Sh	Ch	K
M	N	O	T	A	N	16 ↓	R	U	Y	A
P	J	Z	G	E	N	B	E	N	I	L

In order to check students' knowledge, finding answers to the following questions is given as an independent homework:

1. What processes can occur in a thousandth of a second. 2. When the wheel of a car moves, do all its parts move in the same way? 3. Why doesn't the tower of Pisa fall even if it is tilted? 4. What does physiology say about walking and running? 5. Is it possible to catch a bullet fired from a rifle with the hand? 6. Standing straight on the scale, a person saw a weight of 60 N. He was slightly bent, so his weight decreased, why did the person's weight decrease? 7. On one end of the shayinli scale, a tong with a nut is placed, and on the other, stones are placed to balance it, and then one end of the tong should stand on the end. Tie the other end to a thread and hang it on the shayin's hook and balance the scales. Then light a match and hold it on a string. The thread will break and the top of the clip will fall into the circuit. What is the change in the scales at this time? 8. Is the scale or the scale stones more important for accurate weighing? 9. Why does the leaf fly into the sky when you pull the thread of the leaf.

Answers:

1. A lot of events will happen during this time. Train 1 1,5 cm starts. The plane 10 cm travels 30 cm around the Earth and the Sun in a thousandth of a second 30 m. Light 300 km leads the way. A fly flaps its wings 500-600 times in 1 second. So, in a thousandth of a second, he has time to raise and lower his wing, and so on.
2. If we stick a piece of colored paper on the side of the cart wheel and look at it while the cart is moving, we will see an interesting phenomenon. The paper passes through the lower part of the spinning wheel so quickly that we do not notice it, so it appears that the upper part of the wheel is moving faster than the lower part.
3. The reason why the tower is tilted and does not fall is that they do not exceed the limits of the bases of the vertical line passing through the center of gravity. Second, the foundation is deep in the ground.
4. The difference between running and walking is that during running, the leg touching the ground quickly straightens and pushes the body forward as a result of a sudden contraction of the muscles, the body is completely disconnected from the ground for a moment. Then the body falls back to the ground on the leg that has moved forward quickly at this time. Thus, running consists of jumping from one leg to another.
5. During the war, a French pilot had such an interesting incident. While flying at a height, he 2 km saw something small passing by, saying that it was an insect, he quickly caught it, and it turned out to be a German bullet. We can't imagine the pilot being surprised by this. In fact, the bullet cannot maintain its velocity until it hits the ground. The speed that makes the second g a 6 00- 800 m decreases. At the end of the

road , it drops to 40 m /s . If the plane also flies at this speed, the speed of the bullet is equal to the speed of the plane, and the pilot can catch this bullet [119].

6. This is because the muscles that bend your body at the same time pull our lower body up. This reduces the pressure on the body. Through the process of raising and lowering our body, we see our weight increase or decrease.
7. Does one of the clamps press down when the clamp is on the circuit? Does it go up? Or will it stay in balance? Accordingly, you will know that the body has no weight. In fact, even if it remains attached to the lower side of the clip, it presses on it with less force than when it is inactive. The weight of the short shot is reduced for a moment. Palla naturally rises higher. Both are important. When the warrak is taken away, it becomes upright due to the weight of its tail. The second force pulls it up. This force reduces the weight of the sheet and makes it fly up.

Physical puzzles. Riddles are closely related to human, social life and natural phenomena, and are always based on real ground. It reflects various things in the material world that surrounds us. Riddles serve to develop young people's ability to think, teach them to express a certain idea in an artistic way and to be clever, ingenuity, and the basic competencies of self-development are formed.

Regarding the phenomena of light and heat.

1) the sword that I shot from this, the blue went and opened, (Dawn brightening); 2) the light is hot, my eyes are squinting, (Sun); 3) a double lamp is seen by a double row, a guard, (Eyes, eyelashes).

Regarding mechanical vibrations and sound phenomena

1) zuv goes - zuv comes, invisible, uncatchable, (sh amol); 2) it has four legs and a stone roof (door b); 3) you can't see it if you look there, you can't see it if you look this way. you can't see if you look at your head, you can see if you look at your shadow, (ear).

E about electrical engineering

1) the sword shines in the land, the shells rise (GES); 2) we hung one pear in the house, there was light everywhere (l light bulb); 3).

Physical puzzles as a factor of independent learning. We cannot imagine life without the study of the laws of the material world, the tools that work using them, the laws of physical science in general. In the course of our research, we were able to use puzzles of

various categories for students to gain independent physical knowledge and to develop basic competencies.

About the lecture department A good puzzle .

1) current source that converts internal energy into electrical energy (thermo-element);
 2) a device that converts light energy into electrical energy (photocell); 3) a drawing (scheme) describing the connection methods of electrical devices in the chain; 4) orderly movement of charged particles (current); 5) the Italian physicist who founded the theory of electric current (Volta); 6) a device (battery) used as a power source after charging; 7) one of the main properties of an electron (charge); 8) a device (switch) used to connect and disconnect electricity to consumers at the required time; 9) a device (generator) for supplying electric current at power stations; 10) Italian professor (Galvani) who was the first to observe electrical phenomena in the animal organism (Fig. 3.5)

There are a lot of forms and types of work outside the audience, and they can be divided into 2 groups:

1) works outside the audience; 2) work outside the institution of higher education. Activities outside the auditorium include: physics clubs, physics evenings, physics week, quizzes, contests, publishing wall newspapers and working with additional literature on physics, etc. includes [93].

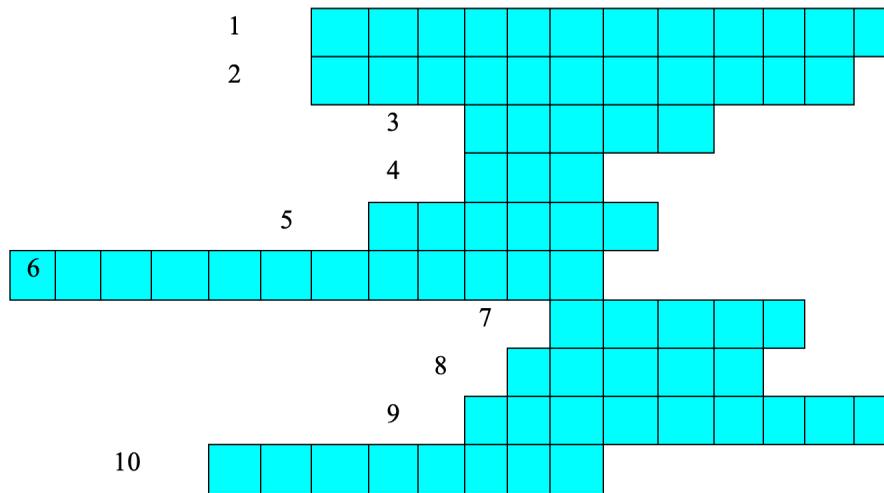


Figure 3.5. A physics puzzle about the electrical department

3.3. Organization of physics club training aimed at developing students' competence

Homework and assignments, as work performed outside the classroom, are of particular importance in the formation and development of students' independent educational activities. The most common type of independent learning activity is homework: oral, written, or experimental [84].

Doing homework is characterized by the fact that students have different types of memory, and therefore a certain part of them cannot fully master the educational material during the training. Many of them need to read the text independently after the teacher explains the topic and remember its main idea and structure.

Others read the text in class and need teacher's explanations and reading the text at home to remember the difficult parts. Even if the student has mastered the material during the training, it is useful to give him homework, not only to rework the text of the topic, but also to give tasks on observations, conducting home experiments, and performing creative tasks [29].

The main part of independent works is work on textbook materials. The student's work on homework tasks differs from his work in the training process in that he relies on his own knowledge and experience, not on the advice of the teacher, on the help of the audience team.

Each student determines an approximate independent work plan, taking into account the content of tasks, methods of execution and self-control, taking into account his ability, work pace and method. The teacher often gives brief or detailed instructions orally, in writing, along with homework assignments.

Students find it difficult to complete homework assignments, especially when solving problems, which can be explained not only by the lack of time, but also by the incomplete formation of the necessary knowledge, skills and abilities to solve the relevant problems, and the lack of formation of the skills to apply the acquired knowledge to practice.

In order to facilitate students' ability to solve problems independently from physics, they can be given examples of solving the necessary descriptive problems as handouts. Full introduction to systematic examples of problem solving increases the effectiveness of students' independent activities in completing assignments at home. First, students solve problems using auxiliary materials [132]. As a result, they can solve typical problems as well as problems that require their independent creative approach.

The system of homework and tasks should be chosen in such a way that the teacher can easily check the tasks performed by the student during the lesson, to assess how the student has mastered the learning material and to determine what measures should be taken to correct the shortcomings in time.

In addition to general assignments for all students in the audience (for example, working with a textbook, solving problems), it is sometimes necessary to give individual assignments to gifted students.

Gifted students excel in problem solving and homework. It is important to prepare them for various competitions and Olympiads and meet their individual requirements. New forms of teacher-student cooperation in classroom and extracurricular situations are revealed.

It is important to strive for this when developing a system of homework and assignments, which should include not only the strengthening of learned subjects, but also the solution of tasks that are difficult to master. Homework assignments should include experimental or home-based research elements. In this case, the tasks include studying the phenomenon of water boiling, evaporation, diffusion, surface tension, as well as the principles of operation of radio communication and electric heating devices.

Work outside the audience can be organized in the following forms [93].

- I. Individually: reading textbooks, study guides and additional literature, magazines; preparing abstracts and solving problems; participation in external Olympiads; performing experimental tasks at home; making hand tools.

- II. In groups: physics circles; physics-technical circle g i; technique circle g i; scientific research group; excursion.
- III. Public: physics olympiads, quizzes; physical decade; nights; selection of newspapers. Students' interest in physics depends primarily on the organization of the training process. At the same time, students' interest in physics can be greatly increased through well-organized extracurricular activities. For students who are interested in physics, the knowledge they get in a physics class will not be enough. If the teacher uses new pedagogical technologies, handouts, test tasks, competitive lessons, practices, and visual aids during the training, it will be enough for the students to get full knowledge [93].

Out-of-audience work conducted individually. Theoretical and practical work is carried out individually with the student. Some problems of physics or applied physics are studied. During such training, the student is given a wider and deeper knowledge. The student is prepared for the Olympiads or for entering technical higher education institutions. This will help to achieve the intended goal and the student will love to study science.

Out-of-audience activities conducted in small groups. A special plan is drawn up and regular work is carried out during such training. The number of students can be 6-8. Group training includes: a group of young physicists; works on the equipment of the physics room; preparation for the Olympics; publishing a wall newspaper as a group; as a group, preparing for entrance exams to technical higher education institutions, etc. In such activities, it is possible to make various instruments and make astronomical observations. During group classes, students' knowledge deepens, friendship and cooperation qualities are formed and strengthened in them.

Public works outside the audience. This type includes parallel auditoriums, higher education institutions, scientific conferences and parties held between higher education institutions, Olympiads, young technicians club, quizzes, physics week, showing movies, organizing excursions to a scientific organization or production enterprise, etc.

The circle is one of the main forms of work outside the audience. Among the works outside the audience, the circle is more effective and significant than others due to its long duration, versatility. Students participate in the club voluntarily.

In the course of the research, the physics circle: solving physical problems; solving options for entrance tests to higher education institutions; conducting experimental research; study the principles of operation of physics instruments; public events; making physical and technical instruments; making electrical circuits; aspects such as organizing didactic games from physics, studying the works of physicists were tested, thanks to which students develop basic competencies [31].

The form of work in physics circles can be different, but the goal is the same, that is, to deepen the knowledge of students, to develop their interest in science, to teach them to work independently, to apply their theoretical knowledge in practice, to expand and strengthen the knowledge they have acquired in training. In this, students are prepared to participate in life and production, and the competence of self-development is formed [77].

Choosing topics for the physics club is the most difficult problem. The modernity of the themes of circles is of great importance. In the physics room, work such as making electrical circuits, automatic ringing, connecting a tape recorder, sound recording and playback is carried out. Even if the circles create models that are already known to the students, this is a practical novelty for the student. No matter how useful circle activities are for the student, students should not be overworked.

It is known that students take the first steps to study physical phenomena and laws. That's why it is necessary to arouse students' interest in physics and support their interests in the first days of classes. In the course of the research, since the opinion of students of this age is not yet solid, it is appropriate that the content of the training conducted outside the auditorium and the main form of its conduct should be in the description of the game.

Great attention was paid to the Olympiad of young physicists, which is one of the main

types of training outside the auditorium. Ways to improve the methods of organizing and conducting it were determined. The choice of Olympiad issues is particularly noteworthy. The purpose of organizing the Physics Olympiad in higher education is to arouse interest in the achievements of physics and scientific issues in students, to develop and strengthen it, to teach students to think correctly, to be creative, and to nurture the buds of scientific research in them.

At the beginning of the academic year, the plan for the organization and holding of the Olympiad is determined, and the judges are appointed. A library should be set up in the physics room to help Olympiad participants. The tasks, examples and problems selected for the Olympiad should be interesting, experimental in description, and more complex problems should be solved using various literature [113].

Science Olympiad. This type determines the interest of students in physics. Students will be shown the method of solving the following problems.

Issue 1. If 1000 кг mass wagon is going up a hill along a railway track with an angle of $\alpha = 30^\circ$, what is the work done by the gravitational force on the road $s =$ when the wagon moves with an acceleration of $100 \text{ m/s}^2 = 0.2 \text{ m/s}^2$? Let the coefficient of friction 0,2 and acceleration of free fall be 10 m/s^2 . (Figure 3.6)

Given:

$$m = 1000 \text{ kg}$$

$$\alpha = 30^\circ$$

$$a = 0.2 \text{ m/s}^2$$

$$C = 100 \text{ m}$$

$$\mu = 0.2$$

$$g = 10 \text{ m/s}^2$$

Need to find: $A - ?$

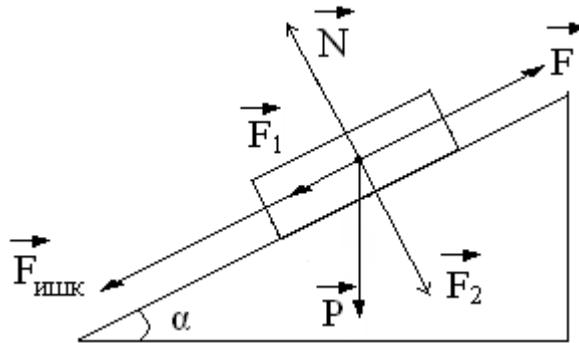


Figure 3.6.

Solving. Let's draw a diagram to solve the problem (Fig. 18). F_m - traction force on the carriage ; P is the component of gravity; F_N - is affected by the compressive force. We determine the downward forces $F_o = mg \sin \alpha = P \sin \alpha$ (2-1) and $F_N = P \cos \alpha = mg \cos \alpha$ (2-2) and apply the II law of dynamics, i.e. $F_m = ma$ (2-3) will be. According to the diagram, the friction force is $F = \mu N = \mu mg \cos \alpha$ (2-4). Then it can be written as follows:

$ma = F_m - mg \sin \alpha + \mu mg \cos \alpha$ (2-5) The gravitational force is $F_m = ma + mg \sin \alpha - \mu mg \cos \alpha$ (2-6).

$$\text{Work done } A = G_m \cdot S = m(a + g \sin \alpha + \mu g \cos \alpha) \cdot s \quad (2-7)$$

We calculate by putting the numerical value.

$$A = 1000 \text{ кг} \left(0,2 \frac{\text{M}}{\text{с}^2} + 10 \frac{\text{M}}{\text{с}^2} \cdot \frac{1}{2} + 0,2 \cdot 10 \frac{\text{M}}{\text{с}^2} \cdot 0,8666 \right) \cdot 100 \text{ м} = 693 \text{ кЖ}.$$

Answer: $A = 693 \text{ кЖ}$.

Issue 2. Determine the pulling force G' of the motor of the car moving up the hill with an acceleration of $a = 1 \text{ m/s}^2$. The slope of the hill is on every 25 m road 1 m. The weight of the car is $R = 9.8 \cdot 10^3 \text{ N}$. Friction coefficient $\mu = 0.1$.

Given:

$$P = 9.8 \cdot 10^3 \text{ Н}, a = 1 \text{ m/s}^2, g = 9.8 \text{ m/s}^2, \sin \alpha = 1/25 = 0.04, \mu = 0.1, G' = ?$$

Solution: We divide the weight R of the car into two components. The force G' driving the car down the mountain is parallel to the mountain surface (Fig. 2.4). N normal compressive force perpendicular to the mountain surface : $N = \mu mg \cos \alpha$ (2-8).

the engine F_1 and F_{aer} forces of the car going up the hill and give acceleration to the car, i.e

$$F = F_1 + F_{\text{aer}} + F_{\text{drag}} \quad (2-9)$$

is the slope of the mountain α - F_1 and D is the angle between the forces equal to.

According to Newton's second law

$$F_{\text{net}} = ma = \frac{P}{g} a \text{ equal to (2-10) . } G'_{\text{down}} = \mu N = \mu R \cos \alpha \quad (2-11)$$

$$F = P \sin \alpha + \mu P \cos \alpha + P \frac{a}{g} = P \left(\sin \alpha + \mu \cos \alpha + \frac{a}{g} \right) = 2213H \quad (2-12)$$

Answer: $G' = 2213 \text{ N}$.

The tasks are different, creative and difficult problems are solved.

Students' theoretical knowledge is deepened and their interest in science is developed during the organization of extracurricular activities. If students are involved in making different physical tools by hand, their creative education, experience and skills will increase, their knowledge will expand and strengthen.

Today, there are many opinions that the improvement of physics education, in particular, may lead to a number of methodological difficulties without the independent educational activities of students. In this regard, it is necessary to take a new approach to the organization of the problem-solving circle in the educational process, to raise the level of creativity, creativity, and the effectiveness of education, to satisfy the student's demand, inclination, and wishes as much as possible. It is important to increase the responsibility and accountability of the student for his educational work, to form his independent acquisition of knowledge, to make sure that he enriches his knowledge by himself in order to find his place in the society [144].

The task of the physics club is not to force the teacher's call to the student that "you should know this", but to awaken inner confidence and aspiration that "I need this and I am able to know this and apply it to life" and serve to inculcate this state in his mind. In the problem-solving class, students should not be bored and their interest in science should not be extinguished by offering problems with complex solutions. From the first day, it is necessary to feel that problem-solving is fun and to cultivate a tendency to consciously problem-solve.

It is desirable to organize circles among parallel course students. It is pedagogically effective if the group is led by the instructor himself. In this case, if the students of the faculty, whom the teacher has trained, are involved in the circle, the teacher knows the inclination of the student's psyche, his abilities, and it becomes easier for him to work [150].

Opinions on the problem of opening physics clubs and organizing their work are presented in many literatures, but it is not explained what topic, how many hours, how it will be conducted, and how effective it will be organized. Based on today's requirements, it should be noted that the physics class is effective if it is held once a week for 80 minutes [150].

The number of students participating in the physics club should not exceed 15-20, otherwise working with a physics club with many members will cause difficulties for teachers on the one hand: on the other hand, it will prevent students from actively participating in the club. It is recommended to divide them into sections if there are more members of the circle [154].

Before starting the work of the circle, the teacher should prepare material for at least 3-4 lessons, plan it and prepare for the organization of the circle. A club started without adequate preparation may initially have many students and very few students will remain in subsequent sessions, because most students come without knowing the goals and objectives of the physics club. In order for this not to happen, it is necessary to prepare a lot to start the circle. Before organizing a "problem-solving club" in physics, outside of classes, students are interested in the club by explaining the purpose and tasks

of the club, getting their opinions through individual conversations with some students, checking their creative work and encouraging them [120].

Before starting the work of the circle, during several trainings, work such as creating various problems depending on the topic, solving tests is done. During the lesson, the teacher assigns students to write simple questions on a problematic topic that interests them.

A. V. Pyorishkin expressed opinions about the development of students' ability to solve problems, increasing their independent educational activity and scientific creativity [121].

Through logical reasoning, solving qualitative problems expands students' knowledge of physical concepts, develops problem-solving skills and independent learning activities. It is not appropriate to form a problem-solving circle and limit the material to be studied. In this case, depending on the conditions of the higher education institution and the students' preparation, they can study various theoretical and practical materials in the circle. In order to successfully continue the activities of the organized physics club, the role of the group leader and assistant selected in the initial training is great. If the first lesson is very interesting and the teacher ignores the next one, the students leave such circles. Therefore, interesting issues should be the same in size in all classes. In the initial sessions, students should be more involved in group work, because when working with students of different levels of thinking, the lower mastering student will try to compete with the high achievers. As a result, after 2, 3 sessions, there are members of the club who are interested in physics and have decided to join the club. Students will be interviewed about their interests, and the plan of 4-5 sessions will be introduced. The contents of the independent lessons are given to the students to prepare at home, and relevant literature is recommended.

Biographies of great physicists, various examples and problems can be included in the topics of lectures given by students in the physics class. Some students, as a result of conducting elementary scientific-research works on the topics recommended by the club leader and chosen by themselves, find the methods of making instructional weapons

and other creative work topics, and give lectures on the results of the club training. Discussions and questions can be used to impart new knowledge . Before moving on to the topic, students are given homework questions for independent study.

"**Problem Solving**" group was organized, a work plan was drawn up. It was emphasized that the use of computers at the level of opportunity is one of the main tools (see Table 3.4).

The methodology of the planned circle training is as follows:

Lesson topic: Solving problems related to uniformly accelerated motions. The educational purpose of the lesson: to briefly introduce students to the main content of the mechanics chapter, the scientists who contributed to the creation of the laws of the mechanics chapter, and their laws [47].

The educational purpose of the training: to introduce students to the history of physical scientists and the creation of laws, to expand their scientific worldview, to increase national pride by introducing them to the contributions of Uzbek scientists to the development of world science.

Table 3.4 Work plan of the "Problem Solving" group (for students of the 1st stage)

t/r.	Subject	Past tense	Venue	Responsible person
1.	Organizational issues: a) discuss and approve the work plan of the "Problem Solving" circle; c) the club captain is elected in the organizational part of the club; s) distribution of work and tasks on topics included in the circular work plan.	September	Physics classroom	Teacher

2.	Studying the legacy of our ancestors who contributed to the development of physics.	October	Physics classroom	Teacher
3.	Solving problems related to uniform and uniformly accelerated motions.	October	Physics classroom	Teacher
4.	Newton's laws Solving problems about forces in nature.	November	Physics classroom	Teacher
5.	Preparation for the night on the topic "Let's study the laws created by scientists" from physics. a) prepare the scenario of the night and discuss it; b) preparing the venue for the night.	November	Physics classroom	Teacher
6.	Solving problems related to mechanical energy, work and power	December	Physics classroom	Teacher
7.	Organization of competition training in the field of mechanics "Who is knowledgeable?" under the slogan	December	Physics classroom	Teacher
9.	Fundamentals of molecular-kinetic theory and solving problems related to ideal gas laws	January	Physics classroom	Teacher
10.	Solving problems related to the laws of liquids and solids	February	Physics classroom	Teacher
11.	Solving problems related to constant current laws, current, voltage and resistance	February	Physics classroom	Teacher
12.	Solving problems related to laws of constant current, current, voltage, resistance	March	Physics classroom	Teacher
13.	Work and power of electric current	March	Physics classroom	Teacher

14.	Spending an evening on the topic "E -lecture - in marriage " with the participation of students of the circle	April	Physics classroom	Teacher
15.	Electromagnetic induction. Solving problems on Lorentz and Ampere force	April	Physics classroom	Teacher
16 .	Laws of reflection and refraction of light. Solving problems related to lenses, photo effect	May	Physics classroom	Teacher
17.	Solving problems related to atomic and nuclear physics	May	physics classroom	Teacher
18.	Completion of work done in the circle during the academic year. Providing literature for independent reading and individual assignments for independent completion during the summer holidays	May	Physics classroom	Teacher

Developmental goal of the training: To deepen the knowledge of the members of the circle, to develop the skills of independent work with textbooks and other additional literature.

Equipment of the training: visual aids, handouts, literature.

Technology used in training: Cooperative learning technology.

Basic concepts and basic knowledge in the lesson: The works of scientists who contributed to the development of the mechanics department of physics and the laws and formulas they created.

Course of the training:

- I. Organizational part.
- II. To acquaint the members of the circle with the purpose and progress of the topic of the circle and to organize independent educational activities in the performance of

their activities.

III. Learning the subject. Organization of groups of circle members and assigning tasks to each group member, achieving high-quality execution of tasks.

IV. The content of the training topic is divided into the following 4 parts:

1) straight motion and its laws, formulas; 2) uneven movements; 3) flat accelerated motions and related formulas; 4) free fall of objects.

The following educational tasks are given for small groups of students in the circle exercise (see table 3.5, 3.6, 3.7, 3.8).

Table 3.5 1 – independent study tasks for the group.

T/r	Educational tasks related to the materials that students should master	Instructions for completing tasks.
1	Read the given text carefully, find answers to the following questions and complete the tasks. Explain plane motion of bodies.	Work collaboratively with a group of students
2.	The concept of speed, path, time in uniform motion, their formula and expression.	Actively participate in question and answer sessions with students.
3.	Can you make a puzzle about this topic ?	
4.	Solve the following questions related to this topic (will be written on the card)	

Table 3.6 2 – independent study assignments for the group.

T/r	Educational tasks related to the materials that students should master. After reading the given text carefully, find the answers to the following questions and complete the tasks.	Instructions for completing assignments.
1	What is uneven motion, give examples of it	Work collaboratively with a group of students

2	How to find speed in uneven motion, what is its unit ?	Actively participate in questions and answers with students
3	How do uneven motions differ from smooth motions?	
4	Can you solve the jagged motion puzzle?	

Table 3.7 3 – independent study assignments for the group.

T/r	Educational tasks related to the materials that students should master	Instructions for completing assignments.
1.	Read the given text carefully and find answers to the following questions and complete the tasks. Explain uniformly accelerated motion	Work collaboratively with a group of students. Actively participate in questions and answers with students .
2.	Formulas for uniformly accelerated motion.	
3.	Their formulas for uniformly accelerated motion.	
4.	Compose a puzzle about uniformly accelerated motion.	

Table 3.8 4 – independent study assignments for the group.

T/r	Educational tasks related to the materials that students should master	Instructions for completing assignments.
1.	Read the given text carefully and find answers to the following questions and complete the tasks.	Work collaboratively with a group of students.
2.	Explain free fall of objects. What formulas do you know about the free fall of	Actively participate in
3.	objects ? Solve the following problem about the free fall of	question and answer sessions with students
4.	objects (will be written on the card)? Prepare a puzzle on this topic	

- V. Organizing a question-and-answer, educational debate among students on a new topic.
- VI. Monitoring and evaluation of student knowledge using test tasks.
Review and analysis of problem solving.
- VII. Reinforce and complete the concepts learned in the lesson.
- VIII. To give an educational task to be done independently at home.

In order to develop the thinking ability of students, the problems chosen are unsystematic, gradually stratified, and the level of complexity increases, develops the ability of independent thinking in all aspects of students, and gives them a creative spirit [121].

Conclusions on Chapter III

1. It was found that the organization of independent educational activities of students based on the competence approach has a positive effect on the process of professional development.
2. It is necessary to organize independent educational activities of students on the basis of a competent approach and to use it appropriately to develop the educational process.
3. The effectiveness of the educational process is determined by the teacher's desire to activate the independent activity of students, and the conditions related to the improvement of independent educational activity of students based on the competence approach were determined in the research.
4. Independent work educationally serves to repeat, strengthen and deepen theoretical knowledge, practical skills and qualifications, and a person who has acquired knowledge based on a competence approach is considered a competent person, capable, responsible for his work and profession.
5. It was determined that in the development of independent activities of students, it is necessary to give them a place to use independent thinking (thinking, analysis, comparison, synthesis, abstraction, generalization and conclusion).
6. In the organization of education based on the competence approach, solving problems aimed at drawing logical conclusions, expanding students' knowledge of physical concepts, and developing problem-solving skills and independent learning activities were studied.



UNIT | 4

ORGANIZING AND CONDUCTING THE PEDAGOGICAL EXPERIMENT-EXAMINATION

4.1 Pedagogical experiment-test purpose and tasks

The purpose of the pedagogical experimental work is to develop the methodology of teaching physics based on the competence approach in technical higher education institutions, to determine the methodology of effective use of pedagogical conditions that allow to increase the professional creativity of students and to form factors. The following tasks were solved according to the planned purpose.

To improve the methodology of physics teaching in technical higher education institutions based on the competence approach, to study the educational and regulatory documents that develop the educational process, to study and generalize theoretical information;

Using questionnaires, to determine information about students' mastery of the basic concepts of organizing the processes of developing creativity and innovative ability. Determining the degree of formation of students' professional creativity in the process of teaching physics using the example of science topics and solving practical problems. Experiments were carried out in 2018-2020 and 428 students were involved. The main experimental work of the research was carried out in 3 stages at Tashkent State Technical University, Jizzakh Polytechnic Institute and Termiz branch of Tashkent State Technical University named after Islam Karimov.

1) grounding experiment stage. Pedagogical activity was organized on the basis of the competence approach of the skills and competences related to the development of students' level of knowledge, interest in the profession and creativity in the process of teaching physics through the competence approach in technical higher education institutions.

In order to achieve the intended goal, the educational activities of the students were observed, questionnaires and interviews were conducted with them. These works made it possible to define research directions and plans. In this regard, the scientific works of scientists and experienced pedagogues were analyzed, in order to develop physics teaching in technical higher education institutions based on the competence approach, the content of practical problem tasks and their implementation methods were determined. practical activity was organized. As a result of the experience, teaching of physics based on the competence approach was developed in technical higher education institutions with the help of methods aimed at the organization of practical trainings with their participation, pedagogical observations, interview questionnaires, practical creative works. analysis on the basis of situational assignments and the effectiveness of the method we used, as well as the level of formation of students on the basis of a competent approach to professional creativity was determined.

The success of the experimental work was ensured by the presence of the following factors. It was found that the training of technical engineers in higher technical educational institutions is at the level of modern requirements, the development of the educational system based on competencies, the improvement of the physics teaching methodology based on the experiences in the economic, cultural and social spheres in the society, and the training of competitive technical engineers became important.

It was determined that the study of educational, training, scientific, educational goals and important aspects of technical higher education institutions of foreign countries can be a methodological support in the training of future technical engineers.

It was shown that higher technical educational institutions serve to increase the efficiency of students by increasing their technical and scientific level, teaching physics at the level of modern requirements.

Development of the professional training of teachers in the training of technical engineers in the teaching of general and specialized subjects, the methodology of the use of innovations was developed and its correctness was confirmed in experimental tests. In the process of conducting experimental work, special attention was paid to the

development of the following features in determining the improved level of professional creativity in physics teaching in students based on the competencies approach;

- ability to think creatively (I can think independently);
- career aspirations (I will be a mature technical engineer);
- I embark on independent research to create innovations;
- I always work in cooperation with my friends and my teacher;
- I like my job, I try to create news.

In the course of the experiments, the written control works, the answers to the tests were analyzed. The important aspects of the method described in the dissertation in teaching physics were summarized as follows:

1. Theoretical and practical knowledge of students was studied and improved based on the competence approach. 2. Basic competencies were formed in the training of competent technical engineers. 3. High efficiency was achieved through the method of individual and differentiated approach to the development of basic competencies for students. 4. By solving problems of different levels in physics, it was possible to create technical expertise, research, invention, and innovative innovations. 5. Independent educational activities were organized through the competence approach. 6. Special attention was paid to national values, interest in science and technology, development of the country, its uniqueness, environmental problems.

'understanding of laws of physics, solutions to problems, works of physicists, pedagogical scientists, experimental measurement devices, nuclear reactions, nuclear reactors, concepts of energy release in nuclear reactions and independent educational activities were tested using a competent approach, various didactic games were used. Interim and final control questions were formulated [76].

In order to determine the effectiveness of experimental work, students were divided into experimental and control groups on the basis of equality. During the experiment, tasks with technical problem situations were developed in order to determine the level of understanding of the formation of the students' levels of competence and professional creativity.

Based on these questions, the level of development of students' competence was determined (see Table 4.1).

From the mentioned indicators, all the students did not express any opinion about the problems of developing the methodology of teaching physics based on the competence approach in technical higher education institutions. This means that students have no idea about the competency approach. Due to the low results, it became clear that it is necessary to organize effective activities in this regard.

In order to develop the creativity and research of students of the 1st level in technical higher education institutions at the foundational and formative stages of experimental work, a survey was conducted using problem assignments (Appendix 1), an analysis of experimental and control groups was conducted, and the levels and criteria of students' independent education were determined.

Table 4.1 The level of development of students' competence

Questionnaire Questions	Answers	Experimental group		Control groups	
		At the beginning of the experiment	At the end of the experiment	At the beginning of the experiment	At the end of the experiment
1. What is a competent approach?	Positive	95	123	75	81
	Satisfied	54	67	66	74
	You are not satisfied	66	23	74	58
2. How important is physics to you?	Positive	75	102	80	88
	Satisfied	34	58	36	51
	You are not satisfied	106	53	99	74

3.	How much do you like your job?	Positive	74	115	65	75
		Satisfied	45	52	40	48
	How do you rate your abilities?	You are not satisfied	96	46	110	90
4.	Do you want to innovate by studying at a technical university?	Positive	59	91	60	66
		Satisfied	41	106	45	50
		You are not satisfied	115	16	110	97
5.	What is the basis for your technical creativity and innovation?	Positive	10	48	12	31
		Satisfied	75	124	78	81
		You are not satisfied	130	41	125	101
6.	What are the physical problems for you ?	Positive	20	41	23	25
		Satisfied	94	105	90	96
		You are not satisfied	101	67	102	92

The value of the component level of the students' mastery of the subject was determined.

The results of the test and written control conducted in the experimental and control groups are given in the table for I high, II middle, III low levels. The stage of formative experiment-test work with students in experimental and control groups and comparative analysis was carried out by practicing teachers and the author in 3 stages in 2017-2020. The test phase was carried out in the 3rd academic year in the subject of "physics". Phase I, 2017-2018 academic year, Phase II, 2018-2019 academic year, Phase III, 2019-2020 academic year, were carried out in groups from the subject of "physics" (see table 4.2, 4.3).

Table 4.2 Development of students' level of learning physics based on the competence approach.

Level of development of students' competence		Criteria		
		High	Medium	Lower
1.	Competence to develop professional creativity in physics in studying educational materials.	He can fully master the topics and apply them in practice, think about creativity, and work independently.	There is a slight misapprehension about the importance of mastering subjects. He always expects help from the teacher.	He cannot master the subjects well Can't speak the subject Can't connect to practice.
2.	Competence in reading, writing, drawing, drawing and schematics, distinguishing technical devices using the laws of physical science when performing independent work	He has a good grasp of the subjects, he can follow the technical processes well, he can read and write at a high speed, he can analyze independently, he can make creative hypotheses, he can conduct experiments independently.	He can perform technical processes and reading, writing, calculations correctly. The level of competence is not good, he cannot conduct experiments independently.	He is not good at working with technical processes, the skills of creative work are not well developed.
3.	Competence in the organization of learning physics in the auditorium, at home.	Physical process Fully distributes household chores The textbook makes full use of additional literature. Has a good understanding of the necessary tools.	Can understand physical processes well, tries to do exercises, but makes small mistakes, relies more on teacher's help.	Can't allocate time properly and doesn't use ready-made materials well.
4.	Competence of independent thinking.	A technician works independently and creatively on various issues, uses inventive elements in practical work.	He tries to independently solve problems given by the teacher, solves problems, but cannot analyze them, tries to solve similar problems.	Tends to use ready-made solutions, asks for help, can't even solve similar problems.

5 .	Self-control competence.	Controls himself in academic work. Tests itself with additional questions. Works independently on errors.	Fulfills the mentioned requirements, makes a few mistakes, only leans on the teacher.	He does not control himself and is indifferent to his work.
-----	--------------------------	---	---	---

Table 4.3 Forms of component development (percentage)

Forms of component development			In the auditorium	Outside the auditorium	Average
At the beginning of the experiment	Experimental group 229	I	9.2	10	9.6
		II	22.7	23.6	23.1
		III	68.1	66.4	67.2
	Control group 230	I	9.6	9.6	9.6
		II	24	23.1	23.6
		III	66.8	67.7	67.2
At the end of the experiment	Experimental group 229	I	19.2	19.7	19.4
		II	62.9	64.6	63.8
		III	17.9	15.7	16.8
	Control group 230	I	10.5	10	10.3
		II	24.5	24	24.2
		III	65.5	66.4	65.9

A system for evaluating students' knowledge was used. The content of the experimental work conducted with students is given in the appendix. Before starting the experiment, it is shown that the content of physics is revealed, the data, topics, the results of the experiment conducted by the researcher and the teachers, the scientific hypothesis of the research, the level of knowledge of the students increases. During the experimental period, the level of mastery of the subject "physics", analysis, the development of students' ability to apply the acquired knowledge, the development of students' independence and creative activity, and professional creativity were taken as indicators of professional practice and the level of growth was determined, which is positive results for the above questions. was obtained, which means that students' competence level developed and high efficiency was achieved.

In the 3rd formative stage of the experiment, the 2017-2019 students' independent learning activities about the laws of physics, problem solutions, scientific works of physicists, electrical measuring instruments, connections, the progress of nuclear reactions and energy release were tested. Different didactic games, puzzles, linguistic games were used, conclusions were summarized. The formation of students' skills and competencies of independent work with textbooks, additional literature and study guides was checked through the following questions and issues. The results of the final control and tests in the experimental and control groups during the 3 academic years of physics are as follows (see Table 4.4).

For intermediate control:

1. A car traveling at a speed of 72 km/h suddenly brakes and stops after 5 s. Find a way to brake?
2. If the flight distance of an object thrown horizontally with a speed of 10 m/s is equal to the height of the throw, what is the height of the object?
3. What is the flow rate of water in the wide part of the pipe, which is 4 times smaller than the diameter of the wide part of 10 m/s?
4. How many molecules are there in carbon dioxide?
5. When heating 800 moles of gas to 500 K isobarically, when 94 MJ of heat is given to it, determine the work done by the gas and how much its internal energy changes?
6. The distance between the charged flat capacitor plates has been reduced by 2 times. How many times does the energy of the field change?
7. The resistance of an electromagnetic coil made of copper wire was 2 Ohm at a temperature of 200 °C, after a long time it became equal to 2.4 Ohm. What temperature did the kettle heat up to?
8. If the distance between the lens and the object is increased by 2 times, and the distance between the lens and the image is decreased by 2 times, how many times will the magnification of the lens change?

Table 4.4 Preliminary results of the experimental and control groups at the beginning of the experiment during 3 academic years

Experience time and academic year	Higher educational institutions	Level of cultivation	assessment values	At the beginning of the experiment			
				Experimental group		No group	
				number	in %	number	in %
I 2017-2018 academic year	TDTU	Highest (excellent)	5	2	8.0%	2	8.0%
		high (good)	4	5	20.0%	5	20.0%
		Medium (satisfactory)	3	18	72.0%	18	72.0%
	JizPI	Highest (excellent)	5	3	11.5%	2	8.0%
		high (good)	4	7	26.9%	9	36.0%
		Medium (satisfactory)	3	16	61.5%	14	56.0%
	Termiz branch of TDTU	Highest (excellent)	5	2	7.7%	2	7.7%
		high (good)	4	5	19.2%	6	23.1%
		Medium (satisfactory)	3	19	73.1%	18	69.2%
	Total	Highest (excellent)	5	7	26.9%	6	7.9%
		high (good)	4	17	65.4%	20	26.3%
		Medium (satisfactory)	3	53	203.8%	50	65.8%

II 2017-2018 academic year	TDTU	Highest (excellent)	5	3	10.0%	3	12.0%
		high (good)	4	8	25.0%	8	32.0%
		Medium (satisfactory)	3	15	65.0%	14	56.0%
	JizPI	Highest (excellent)	5	2	8.0%	3	12.0%
		high (good)	4	8	32.0%	7	28.0%
		Medium (satisfactory)	3	15	60.0%	15	60.0%
	Termiz branch of TDTU	Highest (excellent)	5	2	8.0%	3	10.0%
		high (good)	4	7	28.0%	6	25.0%
		Medium (satisfactory)	3	16	64.0%	17	65.0%
	Total	Highest (excellent)	5	7	9.2%	9	11.8%
		high (good)	4	23	30.3%	21	27.6%
		Medium (satisfactory)	3	46	60.5%	46	60.5%
I 2018-2019 academic year	TDTU	Highest (excellent)	5	3	10.0%	3	10.0%
		high (good)	4	7	25.0%	8	25.0%
		Medium (satisfactory)	3	16	65.0%	15	65.0%
	JizPI	Highest (excellent)	5	7	28.0%	7	10.0%
		high (good)	4	8	32.0%	8	25.0%
		Medium (satisfactory)	3	10	40.0%	10	65.0%
	Termiz branch of TDTU	Highest (excellent)	5	2	8.0%	3	10.0%
		high (good)	4	6	24.0%	5	25.0%
		Medium (satisfactory)	3	17	68.0%	18	65.0%
	Total	Highest (excellent)	5	12	15.8%	13	16.7%
		high (good)	4	21	27.6%	21	26.9%
		Medium (satisfactory)	3	43	56.6%	43	55.1%

9. The equation of motion has the form $x = 0.06 \cos 100 \pi t$. Find amplitude values of vibration amplitude, frequency, period and speed?
10. If the length of a mathematical pendulum is extended by 2 times, how many times will its oscillation period and frequency change?

Control questions:

1. Traveled in 50 s with uniform acceleration. 400 m If the tension of the cable connecting the cars is $2 \cdot 10^6$ N/m, how much will the cable stretch in this movement?
2. If the mass of the projectile 50 кг, the speed of its flight from the barrel of the gun 6 m/s is 800 m/s and the length of the barrel, determine the average power achieved during the firing of the artillery gun.
3. First, water with a temperature of 100°C was poured into the container, then water with a temperature of $500 \text{ } 200 \text{ } 100 \text{ } r^\circ\text{C}$ was poured. Determine the temperature of the mixture?
4. If the accumulator showed a current of 0.5 A when connected to an external resistance of 1 Ohm, and a current of 0.4 A when connected to an external resistance of 3 Ohm, determine the electric current and internal resistance of the source?
5. In a magnetic field with an induction of 0.01 Tl, an electron flies with a kinetic energy of 30 keV perpendicular to the induction lines. What is the radius of curvature of the trajectory of the electron in the field?
6. In the same time, one mathematical pendulum swings 50 times and the other 30 times. If one of them 32 cm is shorter than the other, find their lengths?
7. The capacitor is connected to a standard frequency alternating current network with a voltage of 220 V. The current in this capacitor circuit is 2.5 A. What is the capacity of the capacitor?
8. The distance from the item to the screen 90 cm. At what distance should a lens with a focal length be placed between the object and the screen to form a clear image of the object on the screen? 20 cm
9. 20 cm Using a lens with a focal length 1 m, an image of an object was formed on a screen located beyond it. How far is the object from the lens? What will the image be like?
10. 1 m How many wavelengths of monochromatic radiation with a frequency of 600 Hz are located in the section?
11. Determine the average speed of the car if it covered the first half of the road with a speed of 20 m/s and the second half with a speed of 30 m/s?
12. If the wheel of a wind turbine rotates 60 times in 3 min, what is its period, frequency, and angular velocity?
13. How many times should the initial speed of an object thrown up be increased in

order to increase the height of the ascent by 4 times?

14. 0.02 J of work must be done to stretch the spring to . 4 mm How much work must be done to stretch this spring ?4 cm
15. How many times is the root mean square velocity of an oxygen molecule different from the root mean square velocity of a hydrogen molecule?
16. If the pressure of an ideal gas is increased by 2 times and its temperature is decreased by 2 times, how will its volume change?
17. 142 r Determine the number of molecules in chlorine with mass?
18. Find the mean square speed of hydrogen molecules with a pressure of 105 Pa at a temperature of 0 °C. Density of hydrogen - $\rho = 9 \cdot 10^{-2} \text{ kg/m}^3$.
19. If 10 μ the temperature of oxygen in a cylinder with the same volume is 13 °C, and the pressure is 5 MPa, find the mass of oxygen. Normal atmospheric pressure - $p_0 = 105 \text{ Pa}$. Oxygen density - $\rho = 1.429 \text{ kg/m}^3$.
20. 1 r How many molecules are there in carbon dioxide?

Oral, practical and demonstrative methods of education were used in the process of organization and conduct of pedagogical experimental work. These are heuristic conversation, story, narrative, question-and-answer demonstration and home experiments, written work, test tasks, experimental, qualitative, quantitative, graphic electrical circuit problems, problem-based exercises and problems, computer tools tasks, puzzles and various includes many methods and tools, such as didactic games in the description (see table 4.5).

Table 4.5 Level of customization

Experience time and academic year	Higher educational institutions	Level of customization	assessment values	At the end of the experiment			
				Experimental group		Control group	
				number	in %	number	in %
I 2017-2018 academic year	TDTU	Highest (excellent)	5	7	28.0%	3	12.0%
		high (good)	4	12	48.0%	6	24.0%
		Medium (satisfactory)	3	6	24.0%	16	64.0%
	JizPI	Highest (excellent)	5	7	26.9%	3	12.0%
		high (good)	4	14	53.8%	8	32.0%
		Medium (satisfactory)	3	5	19.2%	14	56.0%
	Termiz branch of TDTU	Highest (excellent)	5	6	23.1%	3	11.5%
		high (good)	4	16	61.5%	7	26.9%
		Medium (satisfactory)	3	4	15.4%	16	61.5%
	Total	Highest (excellent)	5	20	26.0%	9	11.8%
		high (good)	4	42	54.5%	21	27.6%
		Medium (satisfactory)	3	15	19.5%	46	60.5%

II 2018-2019 academic year	TDTU	Highest (excellent)	5	8	10.0%	3	12.0%
		high (good)	4	14	25.0%	8	32.0%
		Medium (satisfactory)	3	4	65.0%	14	56.0%
	JizPI	Highest (excellent)	5	7	28.0%	3	12.0%
		high (good)	4	15	60.0%	8	32.0%
		Medium (satisfactory)	3	3	12.0%	14	56.0%
	Termiz branch of TDTU	Highest (excellent)	5	7	28.0%	3	10.0%
		high (good)	4	13	52.0%	7	25.0%
		Medium (satisfactory)	3	5	20.0%	16	65.0%
	Total	Highest (excellent)	5	22	28.9%	9	11.8%
		high (good)	4	42	55.3%	23	30.3%
		Medium (satisfactory)	3	12	15.8%	44	57.9%

I 2019-2020 academic year	TDTU	Highest (excellent)	5	8	10.0%	3	10.0%
		high (good)	4	14	25.0%	8	25.0%
		Medium (satisfactory)	3	4	65.0%	15	65.0%
	JizPI	Highest (excellent)	5	8	32.0%	3	10.0%
		high (good)	4	14	56.0%	8	25.0%
		Medium (satisfactory)	3	3	12.0%	14	65.0%
	Termiz branch of TDTU	Highest (excellent)	5	7	28.0%	3	10.0%
		high (good)	4	14	56.0%	7	25.0%
		Medium (satisfactory)	3	4	16.0%	16	65.0%
	Total	Highest (excellent)	5	23	30.3%	9	11.5%
		high (good)	4	42	55.3%	23	29.5%
		Medium (satisfactory)	3	11	14.5%	45	57.7%

In the test conducted, students were considered to meet the requirements of DTS. As a result of the experiment, in order to determine the effectiveness of the teaching of physics based on the competence approach in higher educational institutions, the answers to the final questions received from the students, the results of the test and summative exercises were analyzed in terms of quality and quantity (see Table 4.6).

Table 4.6 The answers to the final questions are the results of the test and summative exercises

Academic year	number of students, in person	Experimental group				number of students, in person	Control group			
		Evaluation criteria					Evaluation criteria			
		I- level (top)	Level II (medium)	Level III (bottom)	IV (unsatisfactory)		I- level (top)	Level II (medium)	Level III (bottom)	IV (unsatisfactory)
2017-	77	16	48	12	1	76	10	25	32	9
2018	%	21	62	16	1	%	14	38	34	15
2018-	76	17	48	10	1	77	9	27	33	8
2019	%	22	63	13	1	%	12	35	43	10
2019-	76	22	43	11	0	77	11	27	29	10
2020	%	29	57	14	0	%	14	35	38	13
Total	229	55	139	33	2	230	30	79	94	27
	%	24	61	14	1	%	13	34	41	12

In-depth and comprehensive study of physics, in fact, using modern educational tools and active methods with a competent approach. Especially through the competence approach, students' independent educational activities in physics, increasing cognitive activity, organizing independent work, appropriate use of traditional and non-traditional, active methods and methods of teaching, developed the educational activity of students in physics, increased their motivation for technical specialization, developed their innovative ability, and achieved high efficiency.

4.2. Pedagogical experiment results and their analysis using mathematical and statistical methods

Let's get acquainted with the analysis of the results of the experiment on the organization of the above physics experiment and the method of conducting it. Mathematical statistical methods were used to analyze the results of the experiment. Students mastering physics based on a competency-based approach in technical higher education institutions,

independent study activities, solving problems, each chapter: efficiency of mastering students based on a competency-based approach from the chapters: mechanics, molecular physics, electrostatics, electricity and magnetism, optics, quantum physics, atomic physics, was confirmed by determining the change in the level of knowledge. In the course of students' learning of physics in technical higher education institutions, their level of learning based on the competence approach was confirmed by determining the change in the level of knowledge in the exercises at the end of each chapter.

The effectiveness of control and experimental groups in the process of learning physics based on the competence approach was confirmed by determining the change in the level of knowledge in the exercises at the end of each chapter.

During the experiment, one of the mathematical statistics methods for statistical analysis of the results of the questionnaires taken to determine the level of the students' competence levels of professional creativity was the analysis of the results obtained through the Fisher criterion. In this case, the formula for calculating the empirical value of the Fisher criterion

$$\varphi_{\text{эмп}} = |2\text{арссин}\sqrt{\pi_1} - 2\text{арссин}\sqrt{\pi_2}| \cdot \sqrt{\frac{H_1 \cdot H_2}{H_1 + H_2}}$$

Here, π_1, π_2 the attainment rates, n_1, n_2 , are the number of students in the control and experimental groups, respectively, $\varphi_{\text{крит}}(0.05)=1.67$

Based on this criterion, we put forward the following statistical hypothesis.

H_0 as a hypothesis $\varphi_{\text{эмп}} < \varphi_{\text{крит}}$, i.e. difference in the obtained results, and H_1 as a hypothesis $\varphi_{\text{эмп}} > \varphi_{\text{крит}}$ that is, there is a difference in the obtained results and we consider it to be effective.

To determine the reliability of the results obtained from the pedagogical experiment and to show that the proposed methodology is effective, they were analyzed using *the* χ^2 statistical criterion. Recommendations (B.96-106.) from the book of M.I.Grabar' and K.A.Krasnyanskaya ("Primenenie matematicheskoy statistiki v pedagogicheskix

issledovaniakh" - M.: Pedagogika, 1977) were used.

In general, the calculation of the empirical value of chi-square is carried out according to the following formula.

² in research work χ requires testing the hypothesis that the population, that is, the learning process obeys the normal distribution law. In order to compare the mastery of the experimental and control groups at the beginning of the experiment and at the end of the experiment, the average value of the mastery grade in the groups $\bar{X} = \frac{\sum x_i m_j}{N}$ was taken. Here, x_i is the mastery index, which takes the values 5, 4, 3, 2 according to each evaluation criterion and tasks. m_j is the number of repetitions of grades, N is the number of students participating in the experiment.

In this case, as N_0 hypothesis, the expected probabilities according to the evaluation criteria in the experimental and control groups are equal ($r_{11} = r_{21}, r_{12} = r_{22}, \dots, r_{1s} = r_{2s}$) as an alternative N_1 hypothesis ($p_{11} \neq p_{21}, p_{12} \neq p_{22}, \dots, p_{1c} \neq p_{2c}$) was taken. This statistic χ used criterion 2 to test the hypothesis.

That is

$$\chi^2_{\text{кузатыв}} = \frac{1}{n_1 n_2} \sum_{i=1}^c \frac{(n_1 O_{2i} - n_2 O_{1i})^2}{O_{1i} + O_{2i}}$$
 we use the formula Here, $\chi^2_{\text{кузатыв}}$ the statistical value is the number of respondents who participated in n_1 and n_2 experimental studies, n_1 is the number of respondents in the experimental group, and n_2 is the number of respondents in the control group. O_{1i} and O_{2i} are the sum of the scores obtained against the evaluation criteria in the experimental and control groups, respectively.

its value $\chi^2_{\text{критик}}$ as a pedagogical hypothesis. N_0 if $\chi^2_{\text{кузатыв}} > \chi^2_{\text{критик}}$ dies (results obtained in the experimental groups in the conducted experimental work are ineffective) the hypothesis is rejected, N_1 (results obtained in the experimental groups in the conducted experimental work are effective) hypothesis is accepted.

Here $\chi^2_{\text{критик}}$ - the normalized deviation is determined based on the confidence probability p . The degree of freedom is found by the formula $K = S - 1$.

In order to determine the development of students' level of learning physics based on the competence approach, the level of development outside the auditorium and the performance of questions based on 3 types of evaluations, and 4 evaluation criteria were used in the results of the final control. According to the type of tasks, $K=S-1=2$ in $S=3$ was obtained based on table χ^2 . If we take $p=0.05$, $\chi^2_{\text{критик}}$ the evaluation criteria equal to $=5.99$ and $S=4$, and $K=S-1=3$ is χ equal to $=7.81$ obtained on the basis of Table $\chi^2_{\text{критик}}$.

We also use formulas for finding confidence intervals to determine the performance index of the evaluation. That is, the confidence interval of the experimental group is the confidence deviation

$$\Delta_x = t_\gamma \cdot \frac{S_x}{\sqrt{n}}$$

is equal to, and in the control group:

$$\Delta_y = t_\gamma \cdot \frac{S_y}{\sqrt{n}}$$

is equal to Here, S_x , S_y is the sample variance, which is found by the following formula

$$S_x = \sum_{i=1}^{n-1} \frac{n_i(x_i - x)^2}{m - 1}, \quad S_y = \sum_{i=1}^{n-1} \frac{n_i(y_i - y)^2}{n - 1}$$

From the results found, the confidence interval for the experimental group:

$$\bar{X} - t_{\text{кр}} \cdot \frac{S_x}{\sqrt{n}} \leq a_x \leq \bar{X} + t_{\text{кр}} \cdot \frac{S_x}{\sqrt{n}}$$

Confidence interval for the control group i:

$$\bar{Y} - t_{\text{кр}} \cdot \frac{S_y}{\sqrt{n}} \leq a_y \leq \bar{Y} + t_{\text{кр}} \cdot \frac{S_y}{\sqrt{n}}$$
 is calculated through formulas.

Confidence interval limit values that overlap or intersect with each other make the results less reliable. Therefore, it should be assumed that the confidence intervals in each group do not intersect with each other.

In the implementation of the above statistical analysis, the results of the beginning and end of the experiment were applied to the questionnaire, the results of the experimental

test showing the development of students' competence outside the auditorium and in the auditorium, the development of the students' competence according to the questions and assignments, and the results of the final control and test assignments. Let's get acquainted with the tables and diagrams of statistical calculations for these task types.

Statistical analysis of students' responses to the questionnaire was carried out based on the results at the beginning and end of the experiment (based on Table 26). Taking into account the positive answers given by the students to the questions of the questionnaire, Fisher's dichotomous evaluation criterion was used from the above statistical criteria and presented in the following table of results (see table 4.7).

Table 4.7 Forms of the questionnaire

Questionnaire Questions	indicators	Positive answers		Positive answers	
		Experimental group	Control group i	Experimental group	Control group i
1. What is a competent approach?	In number	149	141	190	155
	In percent	69.3%	66.2%	88.4%	72.8%
	empirical value	0.6 9		4.1 6	
	Critical value	1.67		1.67	
	Summary	H0		H1	
2. How important is physics to you ?	S then	109	116	160	139
	In percent	50.7%	54.5%	74.4%	65.3%
	empirical value	0.7 8		2.0 7	
	Critical value	1.67		1.67	
	Summary	H0		H1	

3. How much do you like your job? How do you rate your abilities?	In number	119	105	167	123
	In percent	55.3%	49.3%	77.7%	57.7%
	empirical value	1.25		4.46	
	Critical value	1.67		1.67	
	Summary	H0		H1	
4. Do you want to innovate by studying at a technical university?	In number	100	105	197	116
	In percent	46.5%	49.3%	91.6%	54.5%
	empirical value	0.58		9.25	
	Critical value	1.67		1.67	
	Summary	H0		H1	
5. What is the basis for your technical creativity and innovation?	In number	85	90	172	112
	In percent	39.5%	42.3%	80.0%	52.6%
	empirical value	0.57		6.12	
	Critical value	1.67		1.67	
	Summary	H0		H1	
6. What are the professional challenges for you?	In number	114	113	146	121
	In percent	53.0%	53.1%	67.9%	56.8%
	empirical value	0.01		2.38	
	Critical value	1.67		1.67	
	Summary	H0		H1	

Therefore, based on the answers of the students who participated in the experiment, the N_0 hypothesis was accepted because Fisher's empirical value was less than the critical value based on the indicators at the beginning of the experiment, and according to the calculations based on the Fisher criterion at the end of the experiment, the empirical value was found to be greater than the critical value, and it became the basis for accepting the N_1 hypothesis. This indicates that at the end of the experiment, the level of knowledge of the students in the experimental groups is higher than in the control groups.

In order to evaluate students' learning of physics based on the competence approach, these results were checked using the xi-square criterion and their results were summarized in the following table (see Table 4.8).

Table 4.8. Statistical analysis of the results obtained on the forms of competence development of students at the beginning of the experiment

Forms of component development		At the beginning of the experiment					
		Experimental group 229			Control group 230		
		I	II	III	I	II	III
		5	4	3	5	4	3
Counting	In the auditorium	21	52	156	22	55	153
	Outside the auditorium	23	54	152	22	53	155
	Average	22	53	154	22	54	154
Average cost of ownership		3.42			3.43		
Efficiency		1.00					
X I square		0.01					
Critical value		5.99					
Criterion summary		H0					
Selective variance		0.44			0.44		
Standard error		0.66			0.66		
Confidence interval		3.29			3.30		
		3.55			3.56		
Detection index		19.3%			19.3%		
Criterion conclusion		N ₀					

According to the above hypothesis, $\chi^2_{\text{кызатуы}} > \chi^2_{\text{критик}}$ since the condition is not fulfilled, the hypothesis N₀ is accepted, that is, the results obtained in the experimental groups in the conducted experimental work do not differ from the results obtained in the control group, and the level of knowledge of both groups is the same (see table 4.9).

Table 4.9. At the end of the experiment, a statistical analysis of the results obtained by the forms of competence development of students

Forms of component development i		At the end of the experiment					
		Experimental group 229			Control group 230		
		I	II	III	I	II	III
		5	4	3	5	4	3
In number	In the auditorium	44	144	41	24	56	150
	Outside the auditorium	45	148	36	23	55	152
	Average	44.5	146	38.5	23.5	55.5	151
Average cost of ownership		4.03			3.45		
Efficiency		1.17					
xi squared		113.92					
Critical value		5.99					
Criterion conclusion		H1					
Selective variance		0.36			0.45		
Standard error		0.60			0.67		
Confidence interval		3.91			3.31		
		4.14			3.58		
Detection index		14.9%			19.5%		

According to the above hypothesis, $\chi^2_{\text{кызатыс}} > \chi^2_{\text{критик}}$ since the condition is fulfilled, hypothesis N_0 is rejected and hypothesis N_1 is acceptable, that is, the results obtained in the experimental groups in the conducted experimental work differ from the results obtained in the control group, and it was found that the efficiency is 17% higher.

During the 1st academic year, the statistical analysis based on the preliminary results of the performance of the selected tasks of the experimental and control groups at the beginning of the experiment was presented in the following table (see Tables 4.10, 4.11).

Table 4.10 Table of statistical analysis based on the results at the beginning of the experiment

Experience time and academic year	Technical higher education institutions	average value		Efficiency	Selective variance		Mean squared deviation	
		Experimental group	Control group		Experimental group	control group	experimental group	control group
Phase I 2017-2018 academic year	TDTU	3.36	3.36	1	0.39	0.39	0.62	0.62
	JizPI	3.5	3.52	0.99	0.48	0.41	0.69	0.64
	Termiz branch of TDTU	3.35	3.38	0.99	0.38	0.39	0.62	0.62
	Total	3.4	3.42	0.99	0.42	0.4	0.65	0.63
Phase II 2018-2019 academic year	TDTU	3.54	3.56	0.99	0.48	0.49	0.69	0.7
	JizPI	3.48	3.52	0.99	0.41	0.49	0.64	0.7
	Termiz branch of TDTU	3.44	3.46	0.99	0.41	0.48	0.64	0.69
	Total	3.49	3.51	0.99	0.43	0.49	0.66	0.7
Phase I 2019-2020 academic year	TDTU	3.5	3.54	0.99	0.48	0.48	0.69	0.69
	JizPI	3.88	3.88	1	0.67	0.67	0.82	0.82
	Termiz branch of TDTU	3.4	3.42	0.99	0.4	0.47	0.63	0.69
	Total	3.59	3.61	0.99	0.56	0.58	0.75	0.76

Table 4.11 Table of statistical analysis based on the results at the beginning of the experiment

Experience time and academic year	Technical higher education institutions	Confidence interval				Empiric value	Critical value	Summary
		experimental group		control group				
Phase I 2017-2018 academic year	T D T U	3.21	3.51	3.21	3.51	-	5.99	H0
	JizPI	3.32	3.68	3.36	3.68	0.64	5.99	H0
	Termiz branch of TDTU	3.2	3.49	3.23	3.53	0.12	5.99	H0
	Total	3.31	3.5	3.33	3.51	0.44	5.99	H0

Phase II 2018-2019 academic year	TDTU	3.35	3.72	3.37	3.75	0.04	5.99	H0
	JizPI	3.32	3.64	3.33	3.71	0.27	5.99	H0
	Termiz branch of TDTU	3.28	3.6	3.28	3.65	0.31	5.99	H0
	Total	3.39	3.58	3.4	3.62	0.34	5.99	H0
Stage III 2019-2020 academic year	TD T U	3.32	3.68	3.35	3.72	0.1	5.99	H0
	QDU	3.62	4.14	3.62	4.14	-	5.99	H0
	Termiz branch of TDTU	3.24	3.56	3.24	3.61	0.32	5.99	H0
	Total	3.47	3.72	3.48	3.74	0.03	5.99	H0

So, the level of performance of intermediate tasks of experimental tests was observed to be the same in both groups.

Statistical analysis based on the final results of the performance of the selected tasks of the experimental and control groups at the end of the experiment during the academic year was presented in the table of accounts (see Tables 4.12, 4.13).

Table 4.12. Table of statistical analysis based on the results at the end of the experiment

Experience time and academic year	Technical higher education institutions	average value		Efficiency	Selective variance		Mean squared deviation	
		Experimental group	Control group		Experimental group	control group	experimental group	control group
Phase I 2017-2018 academic year	TDTU	4.04	3.48	1.16	0.52	0.49	0.72	0.7
	JizPI	4.08	3.56	1.15	0.46	0.49	0.67	0.7
	Termiz branch of TDTU	4.08	3.5	1.16	0.38	0.48	0.62	0.69
	Total	4.06	3.51	1.16	0.45	0.49	0.67	0.7

Phase II 2018-2019 ac- ademic year	TDTU	4.15	3.56	1.17	0.44	0.49	0.66	0.7
	JizPI	4.16	3.56	1.17	0.37	0.49	0.61	0.7
	Termiz branch of TDTU	4.08	3.5	1.17	0.47	0.48	0.69	0.69
	Total	4.13	3.54	1.17	0.43	0.49	0.66	0.7
Stage III 2019-2020 ac- ademic year	TDTU	4.15	3.54	1.17	0.44	0.48	0.66	0.69
	JizPI	4.2	3.56	1.18	0.4	0.49	0.63	0.7
	Termiz branch of TDTU	4.12	3.5	1.18	0.43	0.48	0.65	0.69
	Total	4.16	3.53	1.18	0.42	0.48	0.65	0.69

Table 4.13 Table of statistical analysis based on the results at the end of the experiment

Experience time and ac- ademic year	Technical higher educa- tion institu- tions	detection index		Confidence interval				Empiric value	Critical value	Summary
		experi- mental group	control group	experi- mental group	control group					
Phase I 2017- 2018 ac- ademic year	TDTU	3.60%	4.00%	3.84	4.24	3.29	3.67	8.15	5.99	H1
	JizPI	3.20%	3.90%	3.9	4.25	3.37	3.75	7.29	5.99	H1
	Termiz branch of TDTU	3.00%	3.90%	3.93	4.22	3.32	3.68	11.72	5.99	H1
	Total	1.90%	2.30%	3.96	4.17	3.4	3.62	26.72	5.99	H1
Phase II 2018- 2019 ac- ademic year	TDTU	3.10%	3.90%	3.99	4.32	3.37	3.75	9.27	5.99	H1
	JizPI	2.90%	3.90%	4.01	4.31	3.37	3.75	10.85	5.99	H1
	Termiz branch of TDTU	3.40%	3.90%	3.89	4.27	3.32	3.69	9.35	5.99	H1
	Total	1.80%	2.30%	4.03	4.23	3.43	3.65	29,29	5.99	H1

Stage III 2019- 2020 ac- ademic year	TDTU	3.10%	3.80%	3.99	4.32	3.35	3.72	10.28	5.99	H1
	JizPI	3.00%	3.90%	4.04	4.36	3.37	3.75	11.03	5.99	H1
	Termiz branch of TDTU	3.20%	3.90%	3.95	4.29	3.32	3.69	11.3	5.99	H1
	Total	1.80%	2.20%	4.06	4.25	3.42	3.64	32.49	5.99	H1

According to the above hypothesis, $\chi^2_{\text{кузатыв}} > \chi^2_{\text{критик}}$ since the condition is fulfilled, hypothesis N_0 is rejected and hypothesis N_1 is accepted, that is, the results obtained in the experimental groups in the conducted pilot-testing work differ from the results obtained in the control group, and it was found that the efficiency was higher by 16 % in the first stage, by 17% in the second stage, and by 18% in the 3rd stage (see table 4.14) (4.1, Figure 4.2).

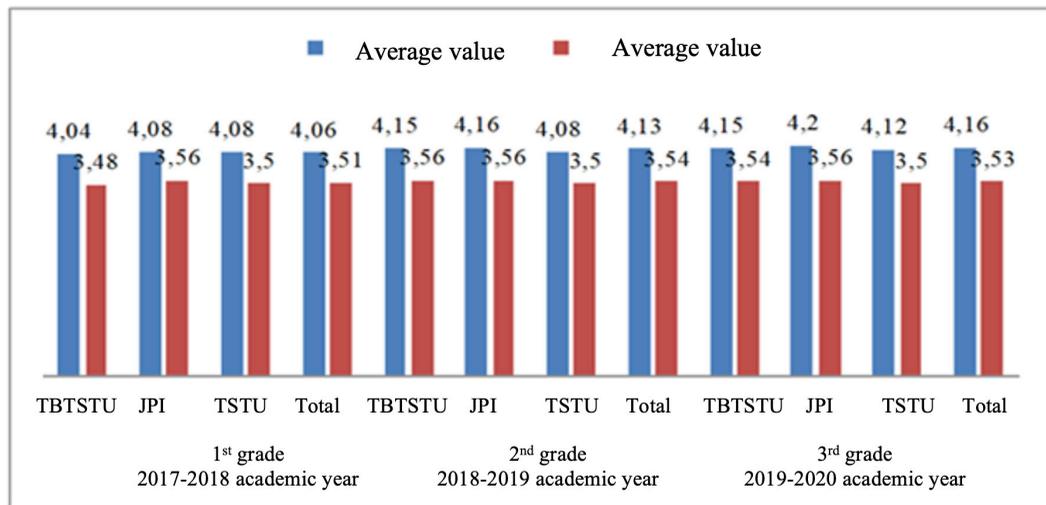


Figure 4.1. Average mastery rate in technical higher education institutions

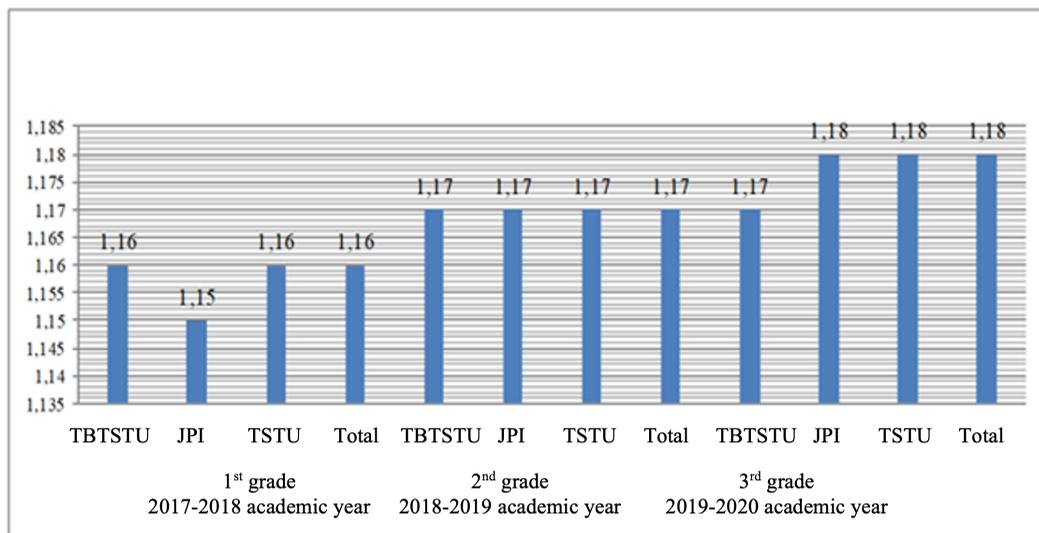


Figure 4.2 . Technia in higher educational institutions performance indicator

Table 4.14 Statistical analysis of the results of the control work conducted on the final control questions and test.

Academic year		2017-2018	2018-2019	2019-2020	Total
Average price	Experimental group	4.03	4.07	4.14	4.08
	Control group	3.47	3.48	3.51	3.49
Efficiency coefficient		1.16	1.17	1.18	1.17
Selective variance	Experimental group	0.41	0.40	0.41	0.41
	Control group	0.75	0.69	0.80	0.75
Standard error	Experimental group	0.64	0.64	0.64	0.64
	Control group	0.87	0.83	0.89	0.86
Confidence interval	Experimental group	3.88	3.92	4.00	4.00
		4.17	4.21	4.29	4.16
	Control group	3.28	3.29	3.31	3.38
		3.67	3.67	3.71	3.60
XI SQUARE		24.12	26.08	25.42	74,72
Critical value		7.81	7.81	7.81	7.81
Criterion summary		H1	H1	H1	H1

So, according to the results of statistical analysis, $\chi^2_{\text{квзатув}} > \chi^2_{\text{критик}}$ since the condition is fulfilled, hypothesis N_0 is rejected and hypothesis N_1 is acceptable, that is, the results obtained in the experimental groups in the conducted pilot-testing work differ from the results obtained in the control group, and it was found that the efficiency is 16 % higher in the first stage, 17% in the second stage, 18% in the 3rd stage, and 17% on average (4.3, Figure 4.4)

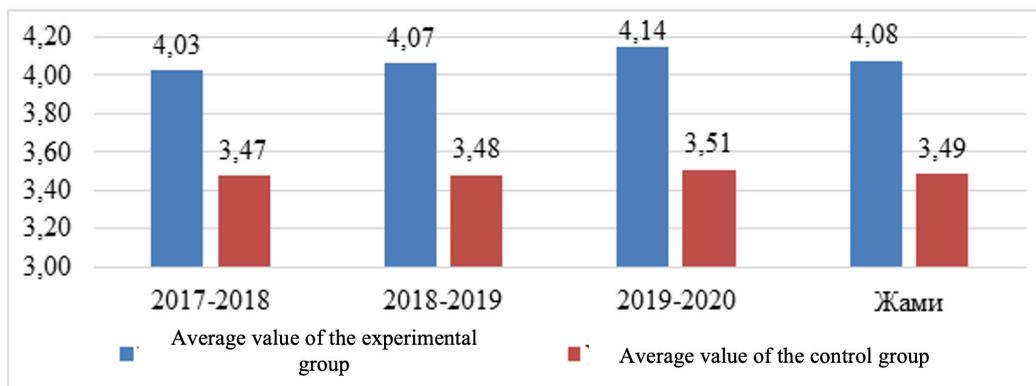


Figure 4.3. The average mastery of the steps on the final test

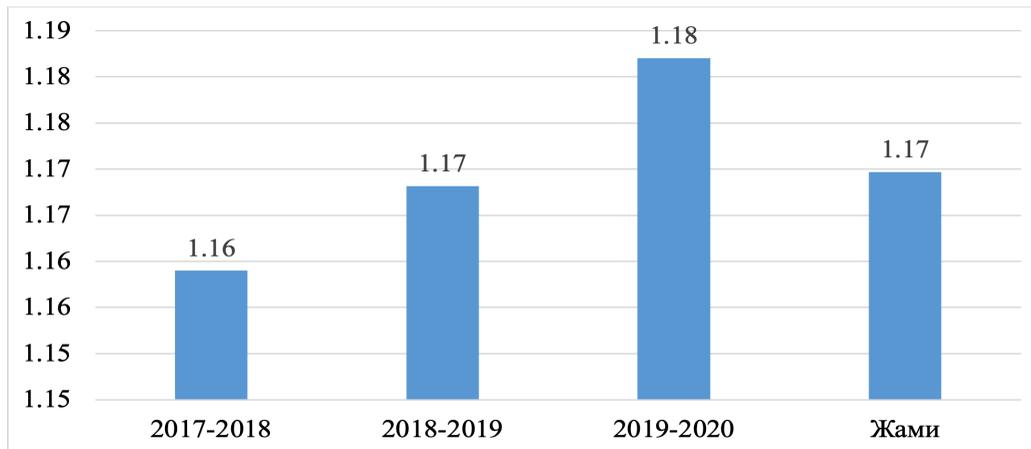


Figure 4.4. The performance indicator of the steps on the final test

The results of the experiments and their analysis:

In the development of the methodology of teaching physics based on the competence approach in technical higher education institutions, it was analyzed the development of competence skills as a result of the exercises organized in the auditorium and outside

the auditorium, as well as solving problems and completing test tasks. Organization of experimental work on the basis of goals and defined tasks created the following situation. Having a clear direction of the specific work of experimental work. Effective use of time in the experiment. Ensuring test performance.

The methodology used in our research, which was carried out in order to theoretically and methodologically justify the organization of scientific innovative development process of teaching physics based on the competence approach in technical higher education institutions, increased interest in the profession of technical specialists, proved to be effective and reliable.

Conclusions on Chapter IV

1. Based on the competence approach, the goals and objectives of the experimental work conducted on the subject of the methodology of teaching physics in technical higher education institutions were determined, and the universities and their courses and groups were selected for the experiment.
3. Correctness of the research hypothesis, achievement of the research goal, created methods during the years of experiment and testing. The effectiveness of the research results, conclusions and recommendations has been proven.
4. As a result of the experiment, the qualities of independence, ingenuity, inquisitiveness and desire of the students were formed, their activity increased, the opportunity to draw conclusions and self-evaluation was created, and educational activities were formed and brought closer to creative scientific activities, which led to the promotion of the ideas that the effectiveness of education increased.
5. Based on the competence approach, the effectiveness of the physics teaching methodology in technical higher education institutions was confirmed by determining the change in the level of knowledge of students' independent learning activities, problem solving, and the effectiveness of mastering each chapter separately.
6. In order to determine the reliability of the results obtained at the end of each chapter and to show that the proposed methodology is effective, it was analyzed using the χ^2 statistical method.
7. The results of the experiment-test work and their analysis in the development of

physics teaching methodology based on competence approach in the technical higher education institutions were analyzed as a result of the exercises organized in the auditorium and outside the auditorium, as well as solving problems and completing test assignments.

8. Teaching physics in technical higher education institutions on the basis of competence approach increased the interest of technical experts in the profession, and it was proved that the methodology used in our research was effective and reliable.

|| **Conclusions**

The following conclusions were reached as a result of the research conducted on the topic of improving the methodology of teaching physics based on the competence approach in technical higher education institutions:

1. The methodical system of teaching physics in technical higher education institutions was defined based on the simplification of the innovative activity of the teacher, the psychological-pedagogical components of the didactic process of the student's independent learning, and the variability of the experimental activity in the innovative educational environment.
2. The components of the creative approach to the methodological aspects of teaching physics were improved based on the introduction of professional frontal laboratory work to the individual psychological motivational-emotional and volitional characteristics of the future technical engineers, as well as the individuality and variability of the student's educational activity.
3. The model of improving the quality of students' knowledge in physics, relying on the conceptual foundations of physics, was improved on the basis of the professional differentiation of educational processes, the intensity of the feedback of the methodological, active-technological, personal-resultative levels of the organization of the physics teaching process.
4. Motivational-valuable, figurative, practical components of physics were improved on the basis of increasing the experimental aspects of problematic and contextual teaching, self-development of students, individualization of experimental activities, and inclusion of interdisciplinary practicum parameters in the environment of variability.
5. Competency approach to physics-independent educational activities in the training of future technical engineers was improved based on the strategic determination of prospects for improving the quality and efficiency of teaching, scientific orientation of laboratory work from the professional physics course departments, evaluation criteria aimed at determining the level of mastery by students, and the introduction of modular training indicators.
6. Education of students as competitive experts in technical higher education institutions

on the basis of competence approach ensures their successful participation in society, production and professional activities.

7. Based on the competence approach, it was clarified that the development of the creative and scientific potential of students in technical higher education institutions, the formation of innovative potential is an urgent scientific and practical necessity.
8. The criteria and indicators for improving the training of future specialists based on the competence approach in the process of teaching physics in technical higher education institutions were clarified, the methodology was developed, and the students' ability to apply knowledge in practice was confirmed.
9. It has been proven that it is necessary to pay attention to the effective use of the competence approach in the technical higher education institutions to develop communicative, self-control, activation, and mathematical literacy.
10. It was theoretically and methodologically justified that strengthening the development of students' independent educational activities based on the competence approach is one of the ways to improve the quality and efficiency of physics education.
11. The efficiency of implementation of suggestions and recommendations developed in connection with this research work on improving the methodology of teaching physics based on the competence approach in technical higher education institutions was 17%.

|| Recommendations

Based on the conclusions, the following proposals were formulated for the improvement of physics teaching methodology based on the competence approach in technical higher education institutions:

1. To generalize the world experiences of future technical engineers to understand and put into practice the ideological issues of their field of study based on the competence approach in a free educational environment, and to accelerate scientific research work on the development of physical science and basic competencies by studying the system of taught sciences.
2. Development of recommendations on the choice of methodology for solving physical problems, performing laboratory work, conducting experiments in improving the methodological preparation of training future technical engineers in technical higher education institutions.
3. Introduction of the importance of organization based on competence approach to the process of organization of independent educational activities of students.

List of References Used

Regulatory documents and publications of methodological importance

1. Law of the Republic of Uzbekistan on Education. September 23, 2020. O'RQ-637
2. On the strategy of Actions for the further development of the Republic of Uzbekistan. Decree of the President of the Republic of Uzbekistan No. PF-4947. February 7, 2017.
3. On approval of the concept of development of the higher education system of the Republic of Uzbekistan until 2030. Decree of the President of the Republic of Uzbekistan No. PF-5847. October 8, 2019.
4. On additional measures to improve the quality of education in higher education institutions and ensure their active participation in comprehensive reforms implemented in the country. Decision PQ-3775 of the President of the Republic of Uzbekistan. June 5, 2018.
5. On measures for further development of the higher education system. Decision PQ-2909 of the President of the Republic of Uzbekistan. // "Khalk sozi" newspaper, April 21, 2017, No. 79 (6773).
6. Resolution PQ-5032 of the President of the Republic of Uzbekistan dated March 19, 2021 "On measures to increase the quality of education in the field of physics and develop scientific research"
7. Address of the President of the Republic of Uzbekistan Shavkat Mirziyoyev to the Oliy Majlis. December 29, 2020
8. Resolution No. 187 of April 6, 2017 of the Cabinet of Ministers of the Republic of Uzbekistan "On approval of state educational standards of general secondary and secondary special, vocational education" // Collection of legal documents of the Republic of Uzbekistan, 2017. No. 14 (774), Article 230 // www.lex.uz
9. Mirziyoev Sh.M. We will continue our path of national development and raise it to a new level. - T.: "Uzbekistan", 2017. 592 p.
10. Mirziyoev Sh.M. The approval of our people is the highest evaluation given to our activities. Volume 2. - T.: "Uzbekistan", 2018. 512 p.

Monograph, scientific article, patent, scientific collections

11. Bloom A. The development of an Integrated Science Curriculum. Information Scheme // Science Education 1981 , vol.3 , - p . 1-15.
12. Delamare F. & W interton J . What is Sompeten ce? – Human Resource Development

- International, Vol. 8, No. 1, March 2005. pp. 27–46.
13. Skinner B.F. The concept of the reflex in the description of behavior. *Journal of General Psychology*, 5, 427-458.
 14. Begmatova D.A. About the physics experiment. // *J. Public education*. -2004. - No. 1. -B. 124-127.
 15. Bolshakova Z.M., Tulkibaeva N.N. Kompetentsii i kompetentnost // *Obrazovanie. Pedagogical science*. #4. - Chelyabinsk, 2009. - S. 13-19.
 16. Burov V.A. Problemy uchebnogo fizicheskogo experimenta. *J. Physics in school*. - No. 7. -2001. -S.3-7. Burov V.A.
 17. Vvedensky V.N. Modelirovanie professionalnoy kompetentnosti pedagoga/ V.N. Vvedensky // *Pedagogy*. - 2003. - #10. - S. 51-55.
 18. Ermakova O.B. Verbitsky A.A. Shkola kontekstnogo obucheniya kak model realizatsii kompetentnostnogo podkhoda v obshchem obrazovanii // *Pedagogika*. – 2009. – No. 2. – S. 12-18.
 19. Efremova N.F., Zvonnikov V.I., Chelyshkova M.B. Pedagogical research and system education // *Pedagogy*. - 2006. - No. 2. - S. 14-22.
 20. Zimnyaya I.A. Klyuchevye kompetentsii – novaya paradigma resultata obrazovaniya / I.A. Zimnyaya // *Vysshee obrazovanie segodnya*. – 2003. No. 5. S. 34-42.
 21. Zimnyaya I.A. Kompetentnostny podkhod. Kakovo ego mesto v sisteme podkhodov k problemam obrazovaniya? // *Vysshee obrazovanie segodnya*, 2006. -S. 20–26.
 22. Kabardin O.F. Methodological fundamental physical experiment. // *J. Physics in school*. - No. 2. -1985. S. 3-9.
 23. Kozyreva O.A. Kompetentnost sovremennogo uchitelya: sovremennaya problema opredeleniya ponyatiya. // *Standard monitoring and education*. -2004.- No. 2. - S.48-51
 24. Kraevsky V.V., Khutorskoy A.V. Predmetnoe i obshchepredmetnoe v obrazovatelnyx standardax // *Pedagogika*. – 20003. – No. 3. – S. 3-10.
 25. Kuzmina N.V. Pedagogicheskoe masterstvo uchitelya kak factor razvitiya knobottey uhashchixsya. // *Voprosy psichologii*. 1984.- #1.- S.16.
 26. Malkin I.I. Rational organization self-sustainable work. / *J. "Narodnoe obrazovaniya"*. -1966. - No. 10. -S. 30-32.
 27. Mitrofanov K. Professionalization professionala: kak rastit uchitelya. // *Obrazovatel'naya politeka №4 (60) 2012*
 28. Polatov Yu.P., Norov Sh. Experimental and qualitative problems in physics. // *J.*

- Public education. -2001. - No. 6. - B. 67-69.
29. Ko'ysinov O.A., Sharipov Sh.S., Aripov M., Begimkulov U. etc. Theory and practice of developing an intellectual system of knowledge acquisition. Monograph. T.: "Science", 2011. -14 p.
 30. Sokolova T.V. Urok-igra kak forma obobshcheniya znanie: formy urokov provodimost v forme igr. //J. Physics in school. -2003. - No. 4. -S. 13-15.
 31. Usarov J.E. Didactic aspects of the development of students' competencies in the process of teaching physics. Monograph. - Tashkent: "Mashhur-press", 2019. - 192 p.
 32. Faizullaev R. Development of information and communication competence of KACB education teachers // Vocational education. - Tashkent: 2014. - #4. -B. 9-11.
 33. Khutorskoy A.V. Klyuchevye kompetence bro component lichnostno-orientirovannoy paradigm education // Narodnoe obrazovanie. - 2003. - No. 2. - S. 58-64.

Other literature used

34. Bloom received a B.S. (ed) et al. A taxonomy of Educational Objectives: Handbook I: The Cognitive Domain. Harvow, 1956.
35. Chomsky N. AspectsoftheTheoryofSyntax/TheM.I.T.Press Massachusetts Institute of Technology Cambridge, 1965. - 247 p .
36. Skinner B.F. Enjoy old age: A program of self-management. New York : W . W. Norton (w ith M. E. Vaughan).
37. Abdullaeva B.S. Methodological and didactic foundations of interdisciplinarity (in the example of teaching mathematics in academic lyceums in social and humanitarian directions): Ped. science. doct ... diss. autoref. - T., 2006, - 49 p. 49.
38. Aleynikov V.V. Preparation of students for the use of computer technology and professional data: Autoref... diss. ped. science - Bryansk, 1998. - 19 p.
39. Arefev R.S. Formirovanie gotovnosti k samoektirovaniyu kommunikativnoi kompetentnosti u studentov pedagogicheskogo VUZa: Diss... kand. ped. science - S., 2004. - 190 p.
40. Asadov Y.M., Turdiev N.Sh., Akbarova S.N., Temirov D.Sh., Babadjonov S. Methods of diagnosing and correcting the formation of competencies in students // Methodological manual. - T.: Research Institute of Pedagogical Sciences of Uzbekistan named after T.N. Kori Niyozzi, 2016. - 160 p.
41. Asilova G.A. Development of professional communication competence of students of customs and tax departments in the state language. Ped. science. doc. (DSc) ...

- diss. auto. - T., 2017. - 66 p.
42. Asilova G.A. Development of professional communication competence of students of customs and tax departments in the state language. Ped. science. doc. (DSc) ... diss. - T., 2017. - 291 p.
 43. Ahmadjanov O.I. Ways to increase the effectiveness of teaching physics in higher technical educational institutions. Ped. science. doctor... diss. autoref. -Tashkent, 1995. -35 p.
 44. Babansky Yu.K. Methodology of physical education in middle school. -M.: Prosveshchenie. 1968.-199 p.
 45. Babansky Yu.K. Optimization process learning. -M.: Pedagogy, 1997. -175 p.
 46. Babansky Yu.K. Methodology of teaching in modern general secondary education school. T.: Teacher. 1990. -230 p.
 47. Bazarova S.D. Systematic justification of vocationally oriented teaching technologies in higher technical education: Ped. science. doc.... diss. autoref. -T., 2009 - 36 p.
 48. Baydenko V.I. Vyyavlenie sostava komentetsiy vypusknikov vuzov kak neokhodimyy etap proektirovaniya gos vpo novogo pokoleniya: Metodicheskoe posobie. - M.: Issledovatel'skiy tsentr problem kachestva podgotovki spetsialistov, 2006. - 72 p.
 49. Bakhmut'skiy, A.E. Monitoring of school education: problemy ireshenia. - SPb.: KARO, 2007. - 176 p.
 50. Bermus A.G. Problemy i perspektivy realizatsii kompetentnostnogo pokhoda v obrazovanii. - M.: "Eidos", 2005.
 51. Bepalko V.P. Slagaemy pedagogical technology. -M.: Pedagogy, 1989. -192 p.
 52. Bilolov I.U. Methodology of laboratornyx zaniyati v processe obucheniya fizike s primeneniem personalnyx EVM. Autoref. dis. ... candy. ped. science - T. UzNIIPN, 1992. -23 p.
 53. Blinov P.A. Bolshaya sovetskaya encyclopedia. — M.: Soviet encyclopedia 1969-1978
 54. Bogdan V.I. i dr. Praktikum po metodike reshchenie fizicheskix zadach. -M.: Vysshaya shkola, 1983. -272 p.
 55. Vygotsky L.S. Pedagogical psychology. - M.: Pedagogika-Press, 1999. - 536 p.
 56. Galperin P. Yes. O metode poetapnogo formirovaniya umstvennyx deystviy. Chrestomatiya po vozrastnoy i pedagogicheskoy psichologii / Pod ed. I. I. Ilyasova, V. Ya. Lyaudis. - M.: MGU, 1981. - P.97-101.
 57. Galperin P.Ya. Introduction to psychology. - M.: Phoenix, 2003. - 332 p.

58. Herbert I.F. Psychology / -M.: Izdatelsky dom "Territory budushchego", 2007. -288 p.
59. G'oziev E., Jabbarov A. Activity and behavioral motivation. - T.: UzMU, 2003. - 124 p.
60. Golish L.V., Faizullaeva D.M. Design and planning of pedagogical technologies. T.: Economy, 2011. – 208 p.
61. Goulman D. Emotional intelligence in business. - M.: "Mann, Ivanov and Ferber", 2013. - S. 512.
62. Grebenyuk O.S., Grebenyuk T.B. Theory obuchenia. Textbook for study. higher fly deluded. - M.: Vlados-press, 2003. -384 p.
63. Guzik N.P., Puchkov N.P. Lecture-seminar system of education chemistry. - Kyiv: Rodyanska school, 1990, - 75 p.
64. Davletshin M.G. Psychology of the modern school teacher. -T.: Uzbekistan, 1999. -29 p.
65. Djuraev R.Kh. Organizatsionno - pedagogicheskie osnovy intensivatsii sistemy professionalnogo podgotovki v uchebnyx zadevaniyax professionalnogo obrazovaniya: Avtoref. diss... dok.ped.nauk.-T.: 1995. - 43p.;
66. Dick Yu.I. under the editorship. Physics practicum in high school. - T.: Teacher, 1991. - 150 p.
67. Dewey D. Psychology and pedagogy myshleniya / Per. English N.M. Nikolskoi. - M.: Sovshenstvo, 1997.— 208 p.
68. Jacques Delors: "Education: a hidden treasure" 1996. <http://do.gendocs.ru/docs/index-132000.html>
69. Jinkin L.J. // Professora Tomskogo universiteta: Biografichesky slovar / S.F. Fominykh, S.A. Nekrylov, L.L. Bertson, A.V. Litvinov. Tomsk, 1998. T. 2. — S. 138-139
70. Zankov L.V. Izbrannye pedagogicheskie trudy. -M.: Pedagog, -1996. -432 p.
71. Z aharova A.V. Psychology obuchenia starsheklassnikov. - M.: Znanie, 1976. - 64 p.
72. Ziyamuhammadov B., Abdullaeva Sh. Advanced pedagogical technology: theory and practice. A methodical guide based on the lesson "Essentials of Spirituality". - T.: Abu Ali ibn Sina, 2001. -80 p.
73. Zimnyaya I.A. Kompetentnostny podkhod. Kakovo ego mesto v sisteme sovremennyx podkhodov k problemam obrazovaniya? (theoretic-methodological aspect) // Vysshee obrazovanie segodnya. 2006. No. 8. – S. 20–26.
74. Zyazyuna I.A. Osnovy pedagogicheskogo masterstva // Uchebnoe posobie. - M.:

- Prosveshchenie, 2012. - 302 p.; Reitman U.D. Knowledge and thinking. Per. English -M.: Mir, 1968. -385 p.
75. Imanova O.A. Metodika razvitiya deyatelnostnoy komponente mediakompetennosti uchashchikhsya seniorshix klassov sredstami informatsionnyx tehnologii. Autoref. diss. ... candy. ped. science - Kirov, 2010.
 76. Ismailov M. A set of problems from physics. -T.: Teacher. 1996. -119 p.
 77. Ispol'zovaniya fizicheskogo experimenta i EVM v uchebnom protesse. Sb. nauch. tr. /. - Sverdlovsk: Sverdl. GPI, 1987. – 112 p.
 78. Isyanov R.G. Cluster approach and formation of modular competence of teachers in higher education institutions. - Tashkent: TGPU, 2014. - 69 p.
 79. Ishmuradova G.I. The content of mechanics education at school and the methodology of its teaching.. dis. ... ped. science to get a candidate's degree. -T.: TDPU, 2005. -18 p.
 80. Ishmuhamedov R., Abdukadirov A., Pardaev A. Innovative technologies in education (practical recommendations for pedagogues - teachers of educational institutions). - Tashkent: Talent, 2008. - 180 p.
 81. Kamenetsky A.G. Experimental zadachi po physics i methodology ix reshenia v vuze. Mechanics. -Simferopol, 1981. -234 p.
 82. Kapitsa P. L. Experiment. Theory. Practice. - M.: Nauka, 1987, -495 p.
 83. Karimov A.S. and others. Fundamentals of electrical engineering and electronics. – T.: Teacher, 1995. -43 p.
 84. Karlibaeva G.E., Matzhanov N.S. Methodology of teaching physics in secondary schools // Instructional manual. -Nukus: "Karakalpakstan" publishing house, 2015. -119 p.
 85. Karlybaeva G.E. Physics teaching technologies and design. Textbook. -Tashkent: Turon-Iqbal, 2018, - 233 p.
 86. Klivasov A.M., Senkevich A.A. Method of formation of system concept for school course physics. // Problemy school textbook. Collection . - M.: Prosveshchenie, 1985. -124 p.
 87. Klabukov A.N. Udmurtskaya Republic: encyclopedia. — Izhevsk, 2008. — C. 398-399.
 88. Comenius Jan Amos: Uchitel uchiteley ("Materinskaya school", "Velikaya didaktika" i dr. proizv. s sokrashch.). M.: Karapuz, 2009, 288 p. ISBN 978-5-8403-1480-7
 89. Konovalova N.A. Razvitie mediakultury studentov pedagogicheskogo vouza. Diss.

- ... candy. ped. science - Vologda, 2004.
90. Korolkova S.A. Kompetentnostny podkhod v professionalnom obuchenii // Vestnik VolGU. Series 6. 2008–2009. - S. 29-33.
 91. Kraevsky V.V. Methodology of pedagogical research / V.V. Kraevsky. - Samara: SamGPI, 1994. - 165 p.
 92. Krutetsky V.A., Lukin N.S. Psychology undergrad. - M.: Prosveshchenie, 1965. - 316 p
 93. Lanina I. Ya. Excellent work in physics. -M.: Prosveshchenie. 1977. – 97 p.
 94. Leontev A.N. Deyatelnost', soznanie, lichnost'. - M.: Politicheskaya literatura. 1977. – 304 p.
 95. Lerner I. Ya. Didakticheskie osnovy metodov obucheniya. - M.: Pedagogy, 1981. – 186 p.
 96. Mavlanov M.M. Psikhologicheskie osobennosti formirovaniya diagnosticheskix umeniy u budushchix uchiteley nachal'nyx klassov v protsesse ix obucheniya v pedagogicheskix vysshix uchebnyx zadevaniyax. Dis... cand. psycho. science - T., 2002. -220 p.
 97. Malafeev R. I. Problematic obuchenie fizike v sredney shkole. -M.: Prosveshchenie, 1980. -128 p.
 98. Markova A.K. Psychology is professionalism. - M.: Znanie, 1996 - 308 p.
 99. Matkin V.V. Mejpredmetnoe problemy poznavtelnyx zadach kak sredstvo formirovaniya interesa k tvorcheskoy deyatelnosti u shkolnikov. Autoref. diss cand. ped. science - M., 1977. - 23 p
 100. Makhmutov M. Organization of problematic education at school. -T.: Teacher, 1977. -195 p.
 101. Mahmudov Yu.G'. A collection of questions and problems from physics (for grades 8-10). Study guide. -T.: Teacher, -1994. -224 p.
 102. Menchinskaya. N.A. "Psychological problems of activity lichnosti v obuchenii" (1971)
 103. Menchinskaya. N.A. "Psychological problems neuspevaemosti shkolnikov" (1971).
 104. Mirzaakhmedov B., Ghafurov N., Tashmukhammedov F. Educational experiment from the course of physics teaching methodology. -T: Teacher, 1989. 111 p.
 105. Mirzakhmedov B. Solving problems requires thinking. Marifat newspaper. April 10, 2004.
 106. Mirzakhmedov B.M., Ghafurov N., Ibragimov B., Sagatova G. Methodology of

- teaching physics. -Tashkent: Teacher, 2002.
107. Mitina L.M. Professional deyatelnost i zdorove pedagoga: Ucheb. posobie dlya stud. higher fly deluded. - M.: "Academy", 2005.
 108. Mitrofanov K.G. Ispolzovanie innovatsionnyx tekhnologiy v systeme vyshego pedagogicheskogo obrazovaniya. M.: Prometheus, 2008.
 109. Mitrofanov K.G. Problem podgotovki pedagogicheskikh kadrov k innovatsionno-experimentalnoy deyatelnosti. M.: Prometheus, 2009.
 110. Mitrofanov K.G. Proektirovanie informatsionno-kommunikativnyx humanitariannyx obrazovatelnyx resursov novogo pokolenia. M.: MGPU, 2009.
 111. Mominov M., Haydarov H. Manual for laboratory work in physics. - T.: Teacher, 1971. -124 p.
 112. Mominho'jaev K., Khutorskaya L. Organization of independent work in physics. - T.: Teacher, 1999. - 142 p.
 113. Musaeva M. Physical classes outside the auditorium. //J. Public education. -2000. - No. 2. -B. 32-35.
 114. Muslimov N.A. Theoretical and methodological bases of professional formation of vocational education teacher. Ped. science. doc. diss. autoref. - Tashkent: TDPU, 2007. - 47 p.
 115. Muslimov N.A. Theoretical and methodological bases of professional formation of vocational education teacher. Ped. science. doc. ... diss. - Tashkent. - 2007.
 116. Nazirov E.N., Kurbanov M. Formirovanie fizicheskikh ponyatiy s pomoshchyu demonstrationtsionnogo experimenta //Voprosy metodologii i metodika formirovaniya nauchnykh ponyatiy uchaschiksya shkol i studentov VUZov. -Chelyabinsk, 1988. -124 p.
 117. Nishonaliev U. New pedagogical and information technologies: problems, solutions. Materials of the republican conference on "Information technologies in education". -T.: TDPU, 2000. -226 p.
 118. Onoprienko O.V. Proverka znaniy, umeniy i navykov uchaschiksya po physics v sredney skole. - M.: Prosveshchenie. 1988. -125 p.
 119. Orifjanov U. and others. Preparing for the Physics Olympiad. - T.: Teacher, 1988. - 73 p.
 120. Palamarchuk V.F. The school flew by. - M.: Prosveshchenie, 1979. - 99 p.
 121. Pyorishkin A.V. Fundamentals of physics teaching methodology. - T, Teacher, 1990. - 320 p.

122. Petrovskaya A. "Diagnostics and razvitie kompetentnosti v obshchenii" (edited by author), M., 1990
123. Petrovskaya L.A. "Kompetentnost v obshchenii", M., 1989
124. Petrovskaya L.A. "Obshchenie - kompetentnost - training: izbrannyye trudy", M.: Smysl, 2007
125. Ponomarev Ya.A. Psychology, creativity and pedagogy. - M.: Pedagogy, 1976. - 280 p.
126. Raven Dj. Kompetentnost v sovremennom obshchestve. Vyyavlenie, razvitie i realization / M.: Kogito-Tsentr, 2002. - 400 p.
127. Radionova N.F. i d.r. Kompetentnostiy approach v pedagogicheskom obrazovanii //Elektronnyi nauchnyi journal «Vestnik Omskogo gosudarstvennogo pedagogicheskogo universiteta». - Petersburg, 2006. www.Omsk.edu.
128. Razumovsky V.G. Development of students' creative abilities in the process of teaching physics. //Teacher's Guide. -T.: Teacher, 1989. -284 p.
129. Rahimov A.A. Psikhologicheskie osobennosti formirovaniya priemov umstvennoy deyatel'nosti na empiricheskoi i teoricheskoi osnoe. Autoref. dis. nor soisk. three. Step. sugar ped. science - M., 1974. - 19 p.
130. Reitman U.D. Knowledge and thinking. Per. English -M.: Mir, 1968. -385 p.
131. Repkina G.V., Zaika E.V. Otsenka urovnya sformirovannosti uchebnoy deyatel'nosti . Tomsk: Peleng, 1993. — 61 p.
132. Rimkeevich A.P. A set of problems from physics. - T.: Teacher, 1992. - 216 p.
133. Rubinstein S.L. Basic public psychology. – Izdanie vtoroe.– M.: Uchpedgiz, 1946 – 704 p.
134. Sayidakhmedov N.S. New pedagogical technologies. - T.: Maliya, 2003. - 172 p.
135. Selevko G.K. Sovremennyye obrazovatel'nost tekhnologii. Uchebnoe posobie. - M.: Narodnoe obrazovanie, 1998. - 172 p.
136. Sergeev I.S. How to implement a competent approach to learning and vneurochnoy deyatel'nosti: practical help . -M.: ARCTI, -2007 . -132 p.
137. Sergeev I.S. Basic pedagogical details . Uchebnoe posobie. Peter, 2004. — 316 p.
138. Serikov V.V. Lichnostnyy podkhod v obrazovanii: concept i tekhnologii / V. V. Serikov; Volgogr. Mr. ped. flour — Volgograd: Peremena, 1994. — 150
139. Serikov V.V. Obrazovanie i lichnost: Teoriya i praktika proektirovaniya ped. system / V.V. Serikov. — M.: Logos, 1999. — 271 p.
140. Serikov V.V. Razvitie lichnosti v obrazovatel'nom protesse / V. V. Serikov. — Moscow:

- Logos, 2012. — 447 p.
141. Serikov V.V. Formirovanie u uchashchixsya gotovnosti k trudu / V. V. Serikov. — M.: Pedagog, 1988. — 191 p. — (OPN. Obrazovanie. Ped. nauki. Obshch. pedagogy);
 142. Sklyarenko A.N. Technology formation of competence // methodical recommendations for teachers. - Moscow, 2011. - 106 p.
 143. Subetto A.I., Chekmarev V. V. Monitoring istochnikov formirovaniya sodержaniya vysshego obrazovaniya. — M.; Kostroma: Izd-vo Kostroma. Mr. ped. un-ta im. N. A. Nekrasova, 1996. — 242 p. ISBN 5-7591-0074-2 500 copies.
 144. Sultanova O'. N. Organization of independent educational activities in physics is an individual and differentiated approach. Teaching problems. -Tashkent, 2008. -B. 49-51.
 145. Sultonova O'.N. Methodology for solving quantitative related problems in creative description. Collection of scientific articles of the International Scientific and Practical Conference "Innovation-2017". - Tashkent: TDTU, 2017. -B. 283-285.
 146. Sultonova O'.N. Kadirova N.T. Physics problem solving technology. Methodical guide. -Termiz: "TKTI", 2018. -121 p.
 147. Sultonova O'.N. The method of directing students to research and research. International scientific and practical conference. "Innovation-2016". Collection of scientific articles. - Tashkent: TDTU, 2016. - B. 108-109.
 148. Sultonova O'.N. Organization of independent educational activities of students is a guarantee of high efficiency Yu NISEF, Republic of Uzbekistan T.N. Research Institute of Pedagogical Sciences of Uzbekistan named after Qori Niyoz, 2016. -B. 139-142.
 149. Sultonova O'.N. Organization of students' independent educational activities in physics. Teaching problems. -Tashkent, 2008. -B. 31-35.
 150. Sultonova O'.N. Technology of conducting physics problem-solving class. Methodical guide. -Tashkent: "TKTI", 2012. -151 p.
 151. Sultonova O'.N., Kholmurodov M. Didactic foundations of new pedagogical technology in teaching physics. Methodical guide. -Termiz, 2012. -64 p.
 152. Talyzina N.F. Formirovanie poznavatelnoy deyatel'nosti uchashchixsya. - M.: Znanie, 1983. - 128 p.
 153. Timova A.V. Interaktivnye metody kak sposob formirovaniya professionalnyx komentetsiy studentov // NovaInfo.Ru, №19, 2014. – S. 1-4.
 154. Tojiev M. Modern information technologies in the educational process.

- (Methodological aspect). -T., 2001. -148 p.
155. Toraev B. , Sulstonova O'.N. Collection of questions and problems from physics, 2018. -365 p.
 156. Turdiev N.Sh. Physics: Textbook for the 6th grade of general secondary schools. - T.: Cartography, 2005. - 160 p.
 157. Turdiev N.Sh. Physics: Textbook for 8th grade of general secondary schools. - T.: "Turon Iqbal" publishing house, 2006. - 160 p.
 158. Turdiev N.Sh., Asadov Yu.M., Akbarova S.N., Temirov D.Sh. Educational technologies aimed at forming students' competencies in the general secondary education system. Research Institute of Pedagogical Sciences of Uzbekistan named after T.N. Kori Niyoz, T.: 2015.-160 p.
 159. Tursunmetov K.A. and others. Physics problem solving methodology. // Continuous learning. - Tashkent: 2015. - #2. - B. 3–10.
 160. Tursunmetov K.A., Uzokov A.A., Bor'iboev I. A set of problems from physics. -T.: Teacher, 2003. -189 p.
 161. Unt I.E. Individualization uchebnyx zadaniy i eyo effektivnost. Autoref. dis... dr. ped. science - Vilnius, 1976. - 40 p.
 162. Physics practicum in high school. // Pokrovsky A.A. under the editorship. -T.: Teacher, 1979.-343 p.
 163. Usarov J.E. Improvement of educational content and development of students' competence on the basis of basic and subject-related competencies. Ped. science. doc. (DSc) ... dis. - Tashkent, 2019. - 267 pages.
 164. Usova A.V Formirovanie u shkolnikov obobshchennykh umeniy i navykov pri osushchestvlenii mejpredmetnykh svyazey. //Pod edit. V.N. Fedorovoy. -M.: Prosveshchenie, 1980. -242 p.
 165. Usova A.V., Bobrov A. A. Formirovanie uchebnyx umeniy i navykov uchashchixsya na urokax physical. - M.: Prosveshchenie, 1988. 112 p.
 166. Usova A.V., Vologodskaya Z.A. Razvitie poznavatelnoy samostoyatel'nosti i tvorcheskoy deyatelnosti uchashchikhsya v processe obucheniya fizike. -Chelyabinsk: Torch, 1996. -126 p.
 167. Educational methodical complex of physics. Asatov O', Khudayberdieva A, Ernazarov Sh, Usarov R. Tashkent.: TKTI, 2019. 363 pages.
 168. Fizicheskiy praktikum dlya klassov s uglublennym izucheniem physical. Pod ed. Yu.I. Dika., O.F. Kabardina. -M.: Prosveshchenie, 1993. -256 p.

169. Fominix S. F. Jinkin Lev Mykolayovich // Encyclopedia of Ukraine: electronic version [website] / gol. Editor: Í.M. Dzyuba, A.Í. Zhukovsky, M.G. Zheleznyak ta ín.; NAN Ukraine, NTSh. Kyiv: Институт енциклопедичних досліджен NAN Ukraini, 2009.
170. Khodjaev B.Kh. Development of historical thinking in secondary school students by means of modernized didactic support. Ped. science. doc. ...dis. - Tashkent. 2016.
171. Khutorsk i y A.V. Proektirovaniya klyuchevykh i predmetnykh kompetentsiy technology. Innovation in educational school. Methody obucheniya: sbornik nauchnykh trudov. - M.: GNU ISMO RAO, 2006. - S. 65-79.
172. Khutorsk i y A.V. Technology projecting klyuchevykhi predmetnyx competence// Internet magazine "Eidos". - 2005. URL: <http://www.eidos.ru/journal/2005/1212.htm>
173. Khutorsk i yA.V. Technology projecting klyuchevykhi predmetnyx competence/ innovation c obshcheobrazovatelnoy to school Method training. - M.: GNU ISMO RAO, 2006. - P.65-79.
174. Cheremukhina T.V. Conducting individual work with students from chemistry. - T.: Teacher, 1989. - 136 p.
175. Chuprikova N.I. Psychology of umstvennogo razvitiya. Principle differentiation. - M.: Stoletiya, 1997. - 234 p.
176. Shatalov V.F. Uchit vsex, uchit kajdogo / Pedagogical research. - M.: Pedagogika, 1987. - 204 p.
177. shchukina G.I. The problem of cognitive interest and pedagogy – M.: Pedagogy, 1971. – 352 p.
178. Elkonin D.B Psikhologicheskie voprosy ognevoy podgotovki. M., 1951.
179. Yusupov A., Yusupov R. A collection of questions and problems from physics – T.: Teacher, 2000.– 64 p.

Contents

UNIT 1	8
THEORETICAL AND METHODOLOGICAL BASIS OF IMPROVING THE METHODOLOGY OF PHYSICS TEACHING ON THE BASE OF A COMPETENT APPROACH IN TECHNICAL HIGHER EDUCATION INSTITUTIONS	
1.1. The current state of the competence approach in teaching physics in technical higher education institutions	8
1.2. Psychological and pedagogical foundations of competence development in physics education	23
1.3. Basic and subject-related competencies to be improved in students in teaching physics in technical higher education institutions	33
UNIT 2	54
THE DIDACTIC SYSTEM OF PHYSICS TEACHING IN TECHNICAL HIGHER EDUCATION INSTITUTIONS BASED ON THE COMPETENT APPROACH	
2.1. Application of pedagogical technologies in improving physics teaching based on the competence approach	54
2.2. Methodology of individual and differentiated approach to improvement of basic competencies	67
2.3. Use of practical educational issues aimed at developing students' competences in physics	77
Conclusions on Chapter II	99
UNIT 3	101
METHODOLOGY OF TEACHING PHYSICS IN TECHNICAL HIGHER EDUCATION INSTITUTIONS BASED ON THE COMPETENT APPROACH	
3.1. Organization of independent educational activities of students based on the competence approach and its effectiveness	101
3.2. Methodology of using educational technologies in the development of students' competence	118

3.3. Organization of physics club training aimed at developing students' competence_____	132
Conclusions on Chapter III_____	146

UNIT | 4 _____ 147

ORGANIZING AND CONDUCTING THE PEDAGOGICAL EXPERIMENT-EXAMINATION

4.1 Pedagogical experiment-test purpose and tasks _____	147
4.2. Pedagogical experiment results and their analysis using mathematical and statistical methods_____	162
Conclusions on Chapter IV _____	176

Regulatory documents and publications of methodological importance _____	181
--	-----