GENERAL DIDACTIC PRINCIPLES AND MODERN APPROACHES OF PREPARING STUDENTS TO SOLVE GENERAL TECHNICAL PROBLEMS FROM PHYSICS TO PROFESSION IN TECHNICAL HIGHER EDUCATION INSTITUTIONS.

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Abstract: *The approach described in this article is intended to prepare students in higher education institutions to tackle general engineering (theoretical mechanics, theory of machines and mechanisms, material resistance, machine details) problems related to the profession.*
Keywords: *Continuous education, developmental education, competence-based education, motivational aspect, meaningful aspect, activity aspect, Hall effect.*

Introduction

Special attention is being devoted across the world to the widespread use of methodological methods in processes of enhancing the quality and efficiency of physics education and supporting student education. Nowadays, it is critical to use production capabilities to efficiently manage the process of physics education and enhance the professional training of students at the world's most advanced institutions. To that end, it is critical to equip students to address career-oriented general technical issues in physics instruction in technical higher education institutions, as well as to enhance career-oriented teaching technique.

The problems of developing theoretical aspects of science in the field of physics, as well as the unique methodological aspects of developing the scientific outlook of students and scientists in our republic, were studied by B.M. Mirzahmedov, M. Jorayev, O.N. Ahmadjonov, C.Q. Khakhorov, Y.M. Polatov, M. Qurbanov, K.R. Nasriddinov, B.M. Nurillayev, A.M. Khudayberganov, G.E. Karlibayeva, M.Y. Mancurova, H.M. Mahmudova, G. Cagatova, M.I. Daminov, I.U. Bilolov, SH.SH. Haydarova, F.F. Toshmuhammedov, Z.C. Bahadirova, D.A. Begmatova and others. The goals envisioned by the Law "On Education" and the "National Program of Personnel Training" are being implemented step by step in the process of large-scale focused work being carried out in our country, the fundamental reform of the education sector. The objective of "Development and implementation of thorough mechanisms of integration of continuing education with science and production" is central to the reforms intended for the continuing education system. The stated aims and tasks are based on "strengthening the material-technical and informational base of educational institutions, providing the educational process with high-quality educational literature and advanced pedagogical technologies" in the complete fulfillment of the tasks set out.

Resolution №. 1533 of the First President of the Republic of Uzbekistan dated May 20, 2011 "On measures to strengthen the material and technical base of higher education institutions and fundamentally improve the quality of training of highly qualified specialists", President of the Republic of Uzbekistan SH.M. Mirziyoyev's Resolution of April 20, 2017 "On Measures for the Further Development of the Higher Education System" (№. PQ-2909) serves as the basis for the solution of problems awaiting resolution in the higher education system and the development of targeted research.

Methods

The current stage of physics development is defined by the presence of numerous forms of education (approaches to it), the most important of which are:

• knowledge-oriented (subject-oriented) education aimed at mastering the system of knowledge, skills and qualifications of students

• developmental education that prioritizes the mental development of a person, first of all, the development of his intellectual abilities

• personal (person-oriented, developmental) education, self-determination, self-development and self- provides the conditions for its implementation

• competence-based education, as a result of which a person acquires knowledge and personal qualities oriented to a certain practice, which will enable him to work successfully and effectively in the professional and social spheres.

The most important aspect is the ability to acquire knowledge in the following areas while solving general technical problems based on physics:

• physical principles of operation of modern technical devices;

• physical approaches to the design of instrumental constructions with the required functional characteristics;

• physical basis of technologies and skills.

• goal setting;

• problem-deterministic search, selection, and analysis of accessible data;

• application of gained knowledge as an indicative foundation for creating professional activity;

• program implementation for attaining outcomes; and

• critical examination of the accomplished results.

Developmental education is the primary concern in the formation of a person's intellectual characteristics. The manifestation of the mind, according to S. L. Rubinstein, is both a mental process and an external action. "The core of intelligence," S.L. Rubinstein noted, "is the ability to distinguish the characteristics required for action in a situation and adapt one's behavior to them."

In this context, two characteristics are particularly important in tackling broad technological difficulties arising from physics:

• targeting;

• content enrichment.

The capacity to do all fundamental mental activities, such as analysis, synthesis, generalization, abstraction, and comparison, develops as a result of solving these difficulties.

Solving broad technical issues from physics, depending on their substance and kind of activity, aids in the development of some of a person's most significant intellectual qualities:

• clarity of mind - simplicity and transparency of thought;

• logical mind - systematic thinking;

• depth of consciousness - the ability to distinguish and understand the most important things in events;

• breadth of mind - versatility of thinking;

• flexibility of mind - the ability to change the direction of thinking;

• independence and originality of mind - creative nature of thinking;

• criticality of the mind - the validity of judgments, serious attitude to the objections that arise.

The creative aspect of the process of addressing general technical issues from physics in the context of a personal approach to education is the most essential quality. Because of the problematic nature of learning, when each researched matter is the subject of inquiry, it encompasses all of the major stages of creative activity and necessitates the expression of appropriate human qualities. The first step is the formation of a creative scenario that is connected to the novelty and relevance of the subject of study. At this step, goal formulation and logical analysis are carried out in order to uncover the physical character of the topic being studied.

Results and Discussion

Physics' key knowledge and activity components are motivating, meaningful, and active.

1. Aspect of motivation. In this case, the advancement of physics is critical in the development of cognitive curiosity and the prospects that open up in the building of a valuable attitude toward physical knowledge. The significance of the issues under examination is that it can

only be effective when students are interested in physics and have a conscious attitude; only with the personal-valuable perception of information does it become knowledge that can be utilized as an indicative instrument of professional action.

In this regard, it is first stressed that physics instructional material satisfies the job of establishing all pedagogical incentives for cognitive activity:

• freshness and summary of educational material;

• updating the material known to students;

• use of information from the history of physics in the lesson (historical and scientific approach, its implementation allows to observe the ways of solving general technical problems from physics);

• vital importance, importance of physical knowledge (their humanitarian value, socio-cultural significance of the decision);

• introducing students to modern science (science and technology) achievements.

2. Content aspect.

Preparing students to solve general engineering problems in physics helps:

• to significantly expand the range of fundamental physical phenomena mastered by students;

• combining physical knowledge;

• ensuring unity of fundamental and practical components of education;

• development of theoretical knowledge, providing necessary support for practical activities.

• mastering a wide range of methods and tools of physical research.

Comprehending the physics and technology of semiconductor device architectures is essential for comprehending basic effects that enhance our understanding of the subatomic universe. The rules created during their study, on the other hand, will be critical in grasping the sophisticated achievements of technological physics. Thus, the quantum Hall effect and the principles governing the behavior of two-dimensional electronic systems in thin semiconductor layers identify the prospective routes for the creation of new semiconductor lasers and high-speed transistors. Thus, quantum physics (quantum macrophysics) exhibits engineering science traits that first surfaced with the creation of semiconductor devices. Semiconductor electronics is an example of several branches of physics, as well as the use of fundamental principles from other natural sciences and mathematics in technological physics.

3. The aspect of activity.

In this regard, the primary focus is on expanding the freedom of students' action - this is the major challenge of the development of general and physical education, particularly as it is carried out in the present conditions of its modernization.

Students' independence can be established as a system of a person, manifested in a variety of talents, throughout the process of educating them to solve broad technical issues in physics, depending on the nature of their content and activity.

In order to improve one of the most essential markers of the educational process - its efficiency - we will examine in depth the relevance of developing students' abilities to answer broad technical issues from physics.

We define educational process quality as a property that defines a pedagogical system's ability to fulfill the actual and prospective demands of people and society, as well as governmental criteria for the training of highly educated experts.

It follows from the definition that mastering students' abilities and experience in solving physics issues helps to enhance (ensure) the quality of the educational process via compliance with all standards.

The quality of the educational process, as an integrated aspect, encompasses factors such as the quality of educational results, the quality of teaching, the quality of educational material, and the quality of educational technology, each of which has specific features. outlined [26].

The breadth of experience characterized by the composition of objects and methods of activity; level of assimilation of reality, quality and consistency of knowledge, formation of problem-solving skills assists in preparing students to solve general engineering problems from physics:

• breadth of experience related to the variety of objects and methods of activity specific to the content and process of solving general technical problems from physics;

• level of assimilation of reality due to the achievement of productive and creative levels of training, defined as the highest in pedagogy, in the process of solving general technical problems from physics.

• the quality of mastery due to the high level of independence of students in obtaining the knowledge necessary for solving problems and using them as an indicative tool for practice-oriented activities.

Special knowledge and abilities in the field of science: mastery of the key techniques and tools of education and parenting are indicators of teaching quality. Solving the challenge addressed in this work, of course, entails personal growth not only of students, but also of the instructor who is tasked with managing students' research-knowledge activities and advising them. In this respect, the instructor should achieve a level that corresponds to the content and procedure of addressing broad technical issues from physics, which will aid in the improvement of the indicators under review.

A.F. It is sufficient to discuss the accomplishments of Ioffe Technical School and N.M. Baumann (Technical University) in this topic. Beginning in the third year of study at these prestigious universities, students are usually prepared to tackle general technical issues in physics as part of their specialty in scientific laboratories. Learning is accomplished through science, which has a distinctly particular nature. It is advised to separate physics instruction for technical students based on the acmeological method to teaching physics. The application of this strategy entails establishing the major components of students' future professional activity, selecting leaders and system builders from among them, and determining the physics-based knowledge, abilities, and credentials required for the activity's implementation. A business game is advised as a kind of instruction for improving the abilities of employing physical knowledge to solve general technological challenges.

Figure 1 depicts the function and importance of physics in the development of successful educational activity skills targeted at future engineers mastering the four major categories of professional activities: research, design, manufacturing, and technology.

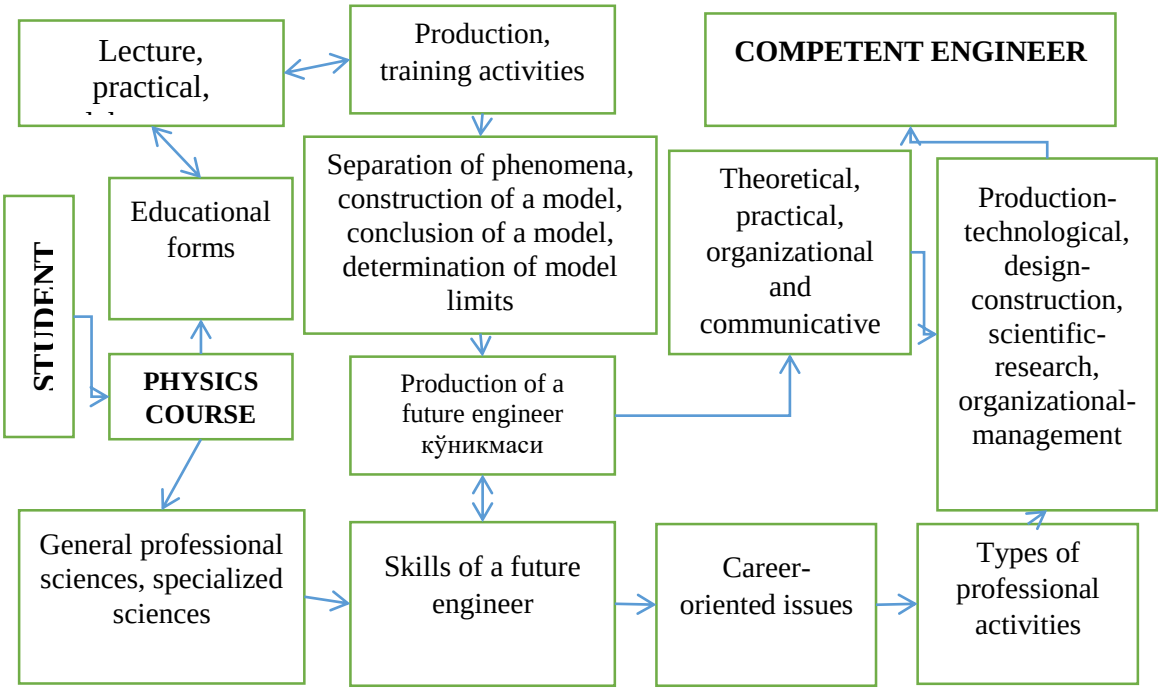

Figure 1. The role of the physics course in the formation of effective educational activity skills of future specialists

The following are the major phases in the development of efficient educational activities targeted at mastering the major types of professional activities by future engineers:
• activation of previous knowledge and skills, motivation;
• formation of new knowledge, skills and activity methods;
• application of learned knowledge;
• improvement of didactic support of educational activities.

It should be mentioned that the teacher's roles are established at each stage: supervising students' activities, giving partial pedagogical assistance, monitoring students' actions, and so on.

The project activity based on physical knowledge has received much attention in the literature as an effective means of problem-based teaching in higher education, and offers a problem-oriented systematic model of teaching physics in higher education institutions, in which students' project activity is to solve cognitive problems. Special emphasis is placed in this study on the potential for utilizing computer technology,including complete and virtual experiences in the laboratory workshop interface.

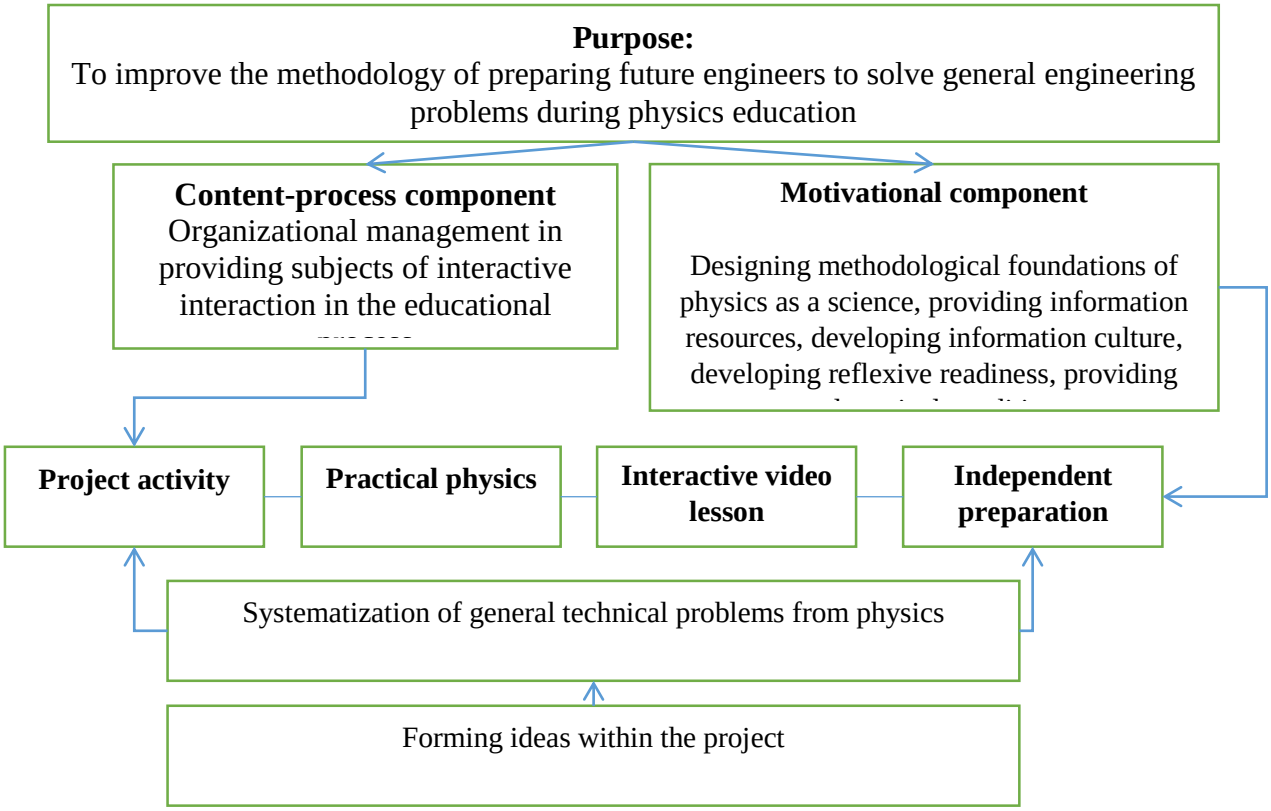

Figure 2: A systematic problem-solving strategy for teaching physics components.

Figure 3 depicts the recommended strategy for developing students' readiness to tackle professional difficulties through project activities in technical higher education institutions. The author proposes to introduce students to the latter by transforming professional educational problems into project assignments. Although the professional orientation of the author's educational assignments is dubious, the notion of structuring the project task in this manner is intriguing.

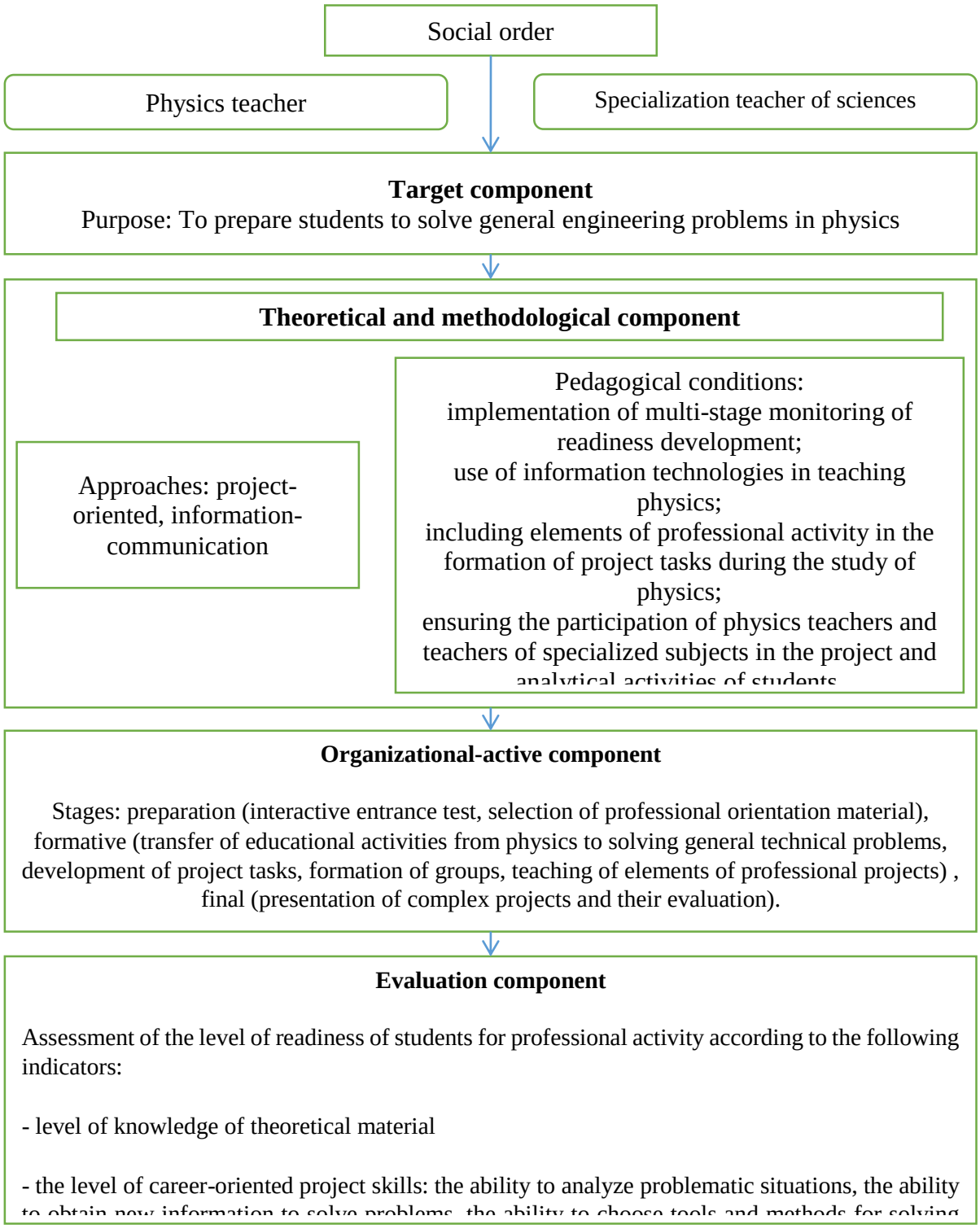

Figure 3. The scheme of the model of formation of technical higher education students' readiness for professional activity

Thus, at work, understanding students' personal experiences of creative activity in novel, non-standard conditions is regarded as a component of physics, required to achieve its potential as the foundation of a culture of creative activity in general.

Conclusion

In technical higher education institutions, methodological techniques (competent, methodical, and active) to preparing students to tackle general engineering issues from physics

were developed. Solving the problem studied in his research necessitates not only the fundamental approaches of higher education teaching, but also a number of general didactic principles: scientificity; professional orientation; existence; differentiation and individualization.

The formation of skills for solving general technical problems from physics aids in the formation of a specialist in a number of acmeological aspects, including: the volume and level of cognitive - professional knowledge; normative - the ability to use existing knowledge to solve problems; communicative - readiness to establish mutual relations.

It contributes to a person's social adaption by greatly increasing competitiveness in the job market via mastery of a creative approach to tackling general technical challenges from physics. The development of skills and experience by students in addressing broad engineering issues in physics contributes to the improvement of the quality and effectiveness of physics education.

The primary knowledge and activity features of physics are: motivating, meaningful, and active. Despite the necessity of educating students to address general engineering issues in physics, the research reveals that no deliberate study of this subject in terms of its content, organizational forms, and teaching techniques has been conducted.

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