

COMPETENCE-BASED APPROACH AS A BASIS FOR THE FORMATION OF RESEARCH COMPETENCE AMONG FUTURE PHYSICS TEACHERS

Nurmatova Dildora Jumaboyevna
Teacher at the Department of "Theoretical and Experimental Physics"
Faculty of Physics, Qarshi State University

Abstract

In this article, the main attention in the preparation of future physics teachers for research activities based on a competence-based approach is paid to subject, necessary or core competencies. The content of subject and professional competencies, in particular, the professional training of a future physics teacher, is disclosed. In addition, the composition of professional competencies has been determined.

Keywords: Competence, competencies, scientific research, activity, profession, approach, formation, physics, stages

КОМПЕТЕНТНОСТНЫЙ ПОДХОД КАК ОСНОВА ФОРМИРОВАНИЯ ИССЛЕДОВАТЕЛЬСКОЙ КОМПЕТЕНЦИИ У БУДУЩИХ УЧИТЕЛЕЙ ФИЗИКИ

Нурматова Дилдора Джумабоевна

Преподаватель кафедры "Теоретическая и экспериментальная физика"
Физический факультет Каршинского государственного университета

Аннотация

В данной статье основное внимание при подготовке будущих учителей физики к научно-исследовательской деятельности на основе компетентностного подхода уделено предметным, необходимым или основным компетенциям. Раскрыто содержание предметных и профессиональных компетенций, в частности, профессиональной подготовки будущего учителя физики. Кроме того, определен состав профессиональных компетенций.

Ключевые слова: Компетентность, компетенции, научные

исследования, деятельность, профессия, подход, формирование, физика,
этапы

Introduction. This article serves as a certain contribution to the implementation of tasks outlined in the "Action Strategy for Further Development of the Republic of Uzbekistan," the Presidential Decree No. PF-5349 dated February 19, 2018, on "Information Technologies and Communications," the Resolution No. PQ-2909 dated April 20, 2017, on "Measures for Further Development of Higher Education," as well as other normative-legal documents related to this field, which aim to improve the quality of education in higher education institutions and ensure their active participation in the broad reforms being carried out in the country[1]. The strategic and national goal of higher education systems today is being shaped through modernization and innovative development. To solve these strategic tasks, the most important qualities of a person are initiative, creative thinking, the ability to find non-standard solutions, the ability to choose a professional path, and readiness to learn throughout life.

In our country, the active implementation of a competency-based approach has been carried out over the past decade. Interpreting the competency-based approach allows for preserving the rich work experience in training local scholars and practitioners, elevating it to a new stage of development, and enabling the preservation of traditions, practical and theoretical developments in this field. "As you can see, the understanding of skills is slightly broader than 'competencies.' However, the theory of skill development is not required. In English, there is no exact equivalent of the concept of 'skill' that we use. The term 'competence' began to be used when the educational practice in the Anglo-American education system encountered the issue of activity-oriented education [2]. Traditionally, the four elements included in the content of national public school education, as noted by A.I. Savenkov, are not only a guarantee of growth but also a key factor in the further development of students' culture. The presented elements describe in a relatively complete and precise way the various levels of competence that need to

be considered in the development of educational content [3]. Combining the approaches of I.Y. Lerner and foreign authors, A.I. Savenkov presents four meaningful levels for the development of competence, which, according to him, form the "integrative model of competence" for the education system:

1. Knowledge and its organization;
2. The application of knowledge in science is presented as skills and competencies.
3. Intellectual and creative potential of an individual – competence is seen as a variant of "practical intelligence", the ability to creatively apply knowledge, skills, and competencies.
4. It is not enough just to have knowledge, skills, abilities, and intellectual and creative potential; a positive, emotional, and ethical attitude toward them is also necessary. Recent research in the field of emotional intelligence has given special importance to this component [6, 7].

Research methodology. The concept of "methodology" has two main meanings:

1) a specific system of methods used in a particular field of activity (science, politics, art, etc.); 2) a theory about this system, the general theory of the method, the active theory [3]. The methodology of science, as an independent research field, aims to clarify the content, possibilities, limits, and interrelations of scientific methods. E.V. Ushakova develops a system of methodological concepts reflecting the conditions, tools, and principles of scientific knowledge in a general sense. Her task is to clarify and study the already existing research tools, find ways to improve them, i.e., to involve a scientific, active, and critical approach in the development of scientific methods [3]. L.A. Mikeshein defines the methodology of scientific knowledge as a philosophical doctrine about the established principles, norms, and methods of scientific-cognitive activity, as well as the forms, structure, and functions of scientific knowledge, emphasizing the growing role of methodology in modern knowledge [3]. L.A. Mikesheina identified three levels of

methodological

analysis:

Specific scientific methodology deals with methods, techniques, and standards, forming and describing the principles, methods, and justifications of specific scientific activities.

General scientific methodology is a teaching about the principles, methods, and forms of cognition that apply to many scientific fields, corresponding to their subject and object of study.

Philosophical analysis of knowledge, followed by philosophical ideas, approaches, and reasoning methods, which can be used in scientific-cognitive activities under certain conditions.

G.Yudin identifies four levels of methodology:

Philosophical methodology as the theory of knowledge, which includes the general principles of epistemology, the dialectical method of cognition, and the general structure of science.

General scientific methodology involves the general concepts and theories that influence all or most scientific fields when solving large-scale methodological problems.

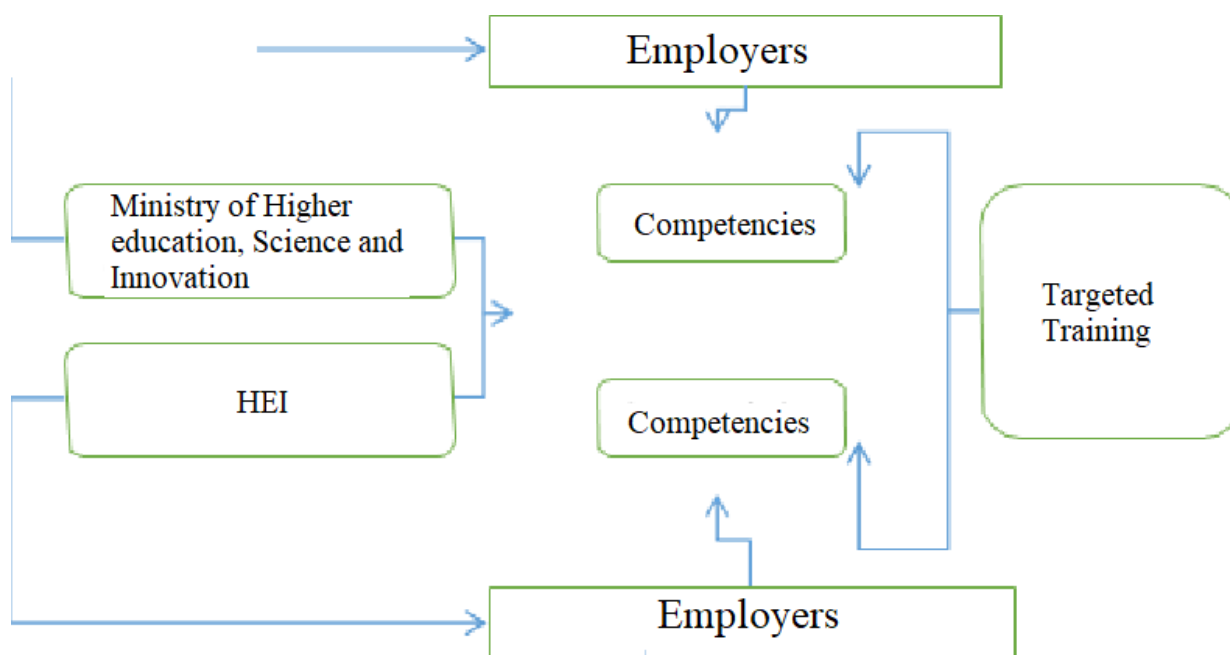
Specific scientific methodology refers to a set of methods, approaches, and special scientific research methods.

Scientific research methods represent a set of procedures that ensure the collection of empirical material and its primary processing.

Thus, today there is no single, universally accepted, established, and complete system of views on the understanding of methodology. Methodology is still in its initial stage. Thus, the general concept of methodology as a level of philosophical knowledge is a doctrine about methods, which is aimed at shaping the system of necessary conditions for human cognitive activity. At the philosophical level, the essence of methodology is considered by various researchers as a doctrine about the structure, logical organization, methods, and tools of human activity in the fields of theory and practice. Scientific research methodology (scientific

knowledge) represents the general scientific level of methodological analysis and is a doctrine about the principles, methods, and forms of cognition that correspond to the subject and object of research in various fields of science. The methodology of science describes the components of scientific research, as well as gives an idea about the sequence of actions of the researcher in the process of solving a scientific problem, the separation of the problem statement, defining the research object, and constructing the research topic. The training of future specialists, including future physics teachers, for scientific research activities is defined by the State Educational Standard (SES) of Higher Education, which is based on competence. The introduction of the third-generation SES into higher education is still an untested experience, which highlights the relevance of theoretical and practical work in this area, including the development of the scientific research readiness of future physics teachers. The analysis and organization of the educational process through hierarchical approaches to the competence-based approach are detailed by I.A. Zimnyaya [5]. She also studied the theoretical and methodological aspects of the competence-based approach in higher education, examined the essence of this approach in the logic of a systems approach, and revealed its connection with other approaches in higher education, including traditional knowledge, skills, and qualifications. The initial concept of the "approach," according to I.A. Zimnyaya, is defined as a perspective that designates the study, design, and organization of a certain phenomenon or process (e.g., education). In an approach, an idea, concept, or principle is presented, meaning that an approach is based on several central categories. For the competence-based approach, these categories are "competence" and "competency" [4]. According to I.A. Zimnyaya, the concept of a four-level methodological analysis leads to the conclusion that there is a unity of philosophy, general scientific, specific scientific, and methodological education and upbringing. This means that various approaches to education coexist simultaneously. These approaches view education from different angles, but they do not exclude each other. Specifically, when new approaches are implemented,

previous ones can be developed and improved. The competence-based approach (not competence itself) is characterized by strengthening the true pragmatic and humanistic direction of the educational process [5]. The competency-based approach today opens up entirely new possibilities for local didactics, but the idea that it is the only way to develop higher education is not supported by all scholars. "The competency-based approach is very promising – it can provide an activity-oriented, practice-oriented direction for the content of education. The only caution to be made is not to absolutize this approach, as it can only effectively cover the subjective side of the content of education" [6]. Thus, in the simplest version that is understandable for all participants of the educational process, competence can be understood as the requirements for a student's preparedness for education in terms of their future professional activity. This holds true for a future physics teacher. Competence is the ability of a person to implement competence (these requirements) in specific situations. Necessary and general professional competencies are less tied to the labor market. Regional and higher education institution components are more "sensitive" to the labor market, allowing for a quick response to employers' demands with rapid updates, i.e., the competencies of higher education institutions are specialized competencies. The sequence of stages for determining the composition of professional competencies that must be formed for training specialists in the field of OTM physics can be as follows (Figure 1).



1st Image: Procedure for Identifying the Composition of Professional Competencies

1. Create a list of key employers for university graduates.
2. Form a list of competencies for specialists in this field based on the previous generation standards set by the university; competencies developed by professors and teachers; recommendations from industry specialists; feedback from graduates.
3. Fill out a survey with proposals to complete the list of competencies and employers.
4. Distribute the surveys and collect them.
5. Analyze the survey results, identifying the most important competencies for specialists as noted by the majority of employers.

Analysis and Results. The final list of competencies for a specific educational program is compiled based on the analysis of the following: the initial list of competencies; the list of additional competencies suggested by employers and graduates; the list of competencies selected for development within this

related to physics. As can be seen, it includes certain elements of scientific-research competence, but it is limited to the student's readiness and ability to conduct scientific and educational research in physics, relative to the main competence. The research competence formed in the process of studying physics will be directed towards scientific research in the field of physics and must be related to a specific scientific research methodology, as well as to the topic that requires knowledge of theories.

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