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DIDACTIC PRINCIPLES FOR COMPETENCY-BASED TEACHING OF NATURAL SCIENCES IN GENERAL SECONDARY EDUCATION

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Abstract

This article discusses the improvement of teaching methods for natural knowledge in general education based on a competency-based approach. It elaborates on the content of instruction, its theoretical and practical significance, professional activity, didactic levels and criteria, as well as the enrichment of reflexive, intellectual, and emotional aspects related to the assessment of natural knowledge. Furthermore, it addresses the creation of mechanisms for establishing connections in studying phenomena and processes, the conscious assimilation of educational material through the application of previously acquired knowledge, skills, abilities, and competencies in new situations, and the integration and continuity of knowledge across various disciplines related to human–nature interactions. These aspects are presented through the use of innovative educational technologies.

Keywords: Competence, international development, natural sciences, educational programs, general education, improvement, efficiency, quality education, integration of scientific research, professional activity, knowledge, skills, abilities.

Introduction

Across the world, numerous scientific studies are being conducted to improve effective systems for developing natural knowledge among students and to establish an axiological attitude toward research activities. In this context, the development of students' scientific worldview is of great importance. In addition, the educational process emphasizes improving natural knowledge, clarifying the features of teaching natural sciences based on a competency-based approach, and fostering a conscious attitude toward nature through the effective use of innovative educational technologies.

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Currently, the criteria that determine the professional competence and capabilities of teachers in the education system include social, methodological, and subject-specific expertise, as well as skills such as cognition, explanation, observation, communication, organization, reputation building, effective interaction, foresight, and attention distribution.

A teacher can successfully organize the pedagogical process and provide quality education only when they recognize their own level of professional competence. In a broad sense, competence refers to the ability to apply knowledge and skills based on practical experience to effectively solve problems within a specific field of knowledge.

The competency-based approach in education directs students toward acquiring various skills and acting effectively in their future social, professional, and personal lives. In particular, in teaching biology, a teacher's professional competence, positive personal qualities, and practical skills play a crucial role. Their knowledge, activity, diligence, modesty, spirituality, culture, and enlightenment contribute to gaining the respect of students and future professionals.

The competency-based approach was initially developed in England as a response to the specific demands of the professional environment, which were not reflected in the internal structures of the education system. The concept of competence is not new in didactics; for instance, linguodidactic competence has long been widely applied in various foreign educational institutions. The origins of the concept of competence lie in psychology, where psychological research was conducted in the teaching of mathematics, physics, and biology.

Literature Review

According to G.N. Ibragimova, competence requires a system of concepts and understanding, and represents the ability to carry out practical activities, enabling the rapid resolution of emerging problems and tasks. A competency-based approach is characterized by the selection of educational content, goals, and objectives based on individual needs and the requirements of future professional activity, as well as by the choice of field-oriented teaching technologies.

According to K.J. Risqulova, the concept of competence refers to a set of sociolinguistic laws, principles, requirements, rules, duties, responsibilities, and

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personal deontological norms necessary for representatives of a particular profession. Furthermore, competency is associated with an individual's practical activity and is expressed through the ability to demonstrate competence standards creatively in professional practice, based on societal demands.

In the view of I.A. Zimnya, competence encompasses an individual's knowledge, intellectual and personal activity, socio-professional experience, and the educational process.

G.K. Selevko defines competence as an individual's ability to mobilize internal and external resources to achieve a specific goal. Internal resources include knowledge, skills, abilities, interdisciplinary connections, psychological characteristics, and value orientations.

John Raven considers competence as a refined ability, emphasizing that it is based on specialized knowledge within a specific discipline, directed toward performing a particular activity. He also associates competence with the presence of knowledge, skills, thinking abilities, and a sense of responsibility for one's actions within a given field.

A.V. Khutorskoy paid significant attention to the development and characteristics of competencies in the education system. He defines competence as a socially predetermined requirement for a learner's educational preparation to ensure effective performance in a particular field. Moreover, he proposed a three-dimensional model of competency-based education, which includes key (core) competencies, general competencies, and subject-specific (professional) competencies.

Analysis and Results

Competence is also understood as a combination of a learner's personal characteristics and their limited experience within a given field of activity. Thus, competence is not merely the acquisition of separate knowledge and skills, but their integrated and generalized mastery. It represents a synthesis of creative, ideological, goal-oriented, emotional, rational, and axiological characteristics of the individual.

O.A. Litvinova emphasizes the importance of ecological competence in the development of primary school students. She defines ecological competence as the ability to organize and design ecological activities based on socio-ecological knowledge, as well as to think and act appropriately in relation to nature.

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In the study conducted by M.K. Shirinov, mechanisms for ensuring continuity and consistency in teaching natural sciences at the primary education level based on a competency-based approach were improved.

N.I. Taylaqov and A.A. Abduqodirov investigated models and forms of distance learning courses, as well as the prospects for implementing distance education within the continuous education system of the country.

B.A. Begalov investigated the issues of econometric modeling of trends in the development of information and communication technologies. U.Sh. Begimqulov, in turn, studied the scientific and theoretical foundations of introducing innovative information technologies into pedagogical education. In particular, he examined the organization of pedagogical education within the modern information technology environment, the problems and prospects of using information technologies in education, and the methodological foundations for creating a unified information and communication environment in educational institutions. He also developed requirements for electronic educational and methodological complexes for higher education institutions.

M.X. Lutfullayev focused on improving the efficiency of the education system through multimedia electronic textbooks. Q.T. Olimov revealed the theoretical and methodological foundations for creating a new generation of educational literature in specialized subjects, while R.F. Safarova studied the theory and practice of mother tongue education in schools of Uzbekistan under conditions of national revival.

Furthermore, N.I. Taylaqov considered the introduction of innovative information technologies into the education system as a key factor in improving educational quality. He developed scientific and pedagogical foundations for creating a new generation of informatics textbooks for the continuous education system, as well as didactic requirements for developing electronic textbooks, and analyzed Internet portals designed for distance learning.

R.X. Xamdamov investigated issues related to training specialists in the field of information technologies in the Republic of Uzbekistan, as well as the challenges associated with the establishment of electronic universities.

J.D. Ashurov analyzed the impact of artificial intelligence technologies on pedagogical processes, including the possibilities of objectively assessing students' acquired knowledge, improving learning outcomes, and enhancing both theoretical and practical aspects of educational materials.

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One of the key advantages of electronic educational resources (EERs) lies in their focus on independent learning, the development of creative thinking, and the formation of skills and competencies, ensuring a deep and comprehensive assimilation of educational materials and scientific information. Moreover, such resources are superior to traditional educational-methodological complexes due to their integration of extensive scientific data, rich visual content, use of animations, and interactive features.

In EERs, texts are presented in an engaging and impactful manner, with key concepts and definitions expressed clearly and precisely. At the same time, they provide opportunities for monitoring and assessing users' knowledge.

Information in EERs is delivered comprehensively through modern multimedia and animation tools. One of their most significant features is the ability to assess acquired knowledge interactively. The development of EERs involves specialists from various fields.

In the educational process, the acquisition of biological knowledge by students, their development as individuals, and the formation of practical experience have become priorities. In this regard, reliance on a competency-based approach is essential, as students not only acquire a certain amount of knowledge and information but also apply it in practical activities. As a result, the process of student development accelerates, and their readiness for social life increases.

The main criterion for selecting educational content based on a competency-based approach is to ensure that students can individualize their activities and apply acquired knowledge, skills, and abilities in solving practical tasks. Within this framework, the following principles are emphasized:

- Teaching is considered a continuous process aimed at acquiring and reproducing experience for individuals;
- Previously developed curricula should be modernized;
- Educational material should be closely related to students' experiences and everyday life;
- The quality of education depends on the level of students' mastery of competencies.

Within the framework of a competency-based approach, students' individual activities are encouraged, and their ability to apply acquired knowledge in practice is strengthened. For example, activities such as preparing different types of food, creating handicrafts using tree leaves, and collecting herbariums

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contribute to reinforcing practical engagement. These acquired knowledge, skills, and abilities further enhance students' understanding and internalization of biological knowledge.

In competency-based education, priority is given to the formation of practical skills and abilities, while knowledge serves as the foundation for their development. The educational process is oriented toward enabling students to acquire life-related practical experience based on their learned knowledge.

An analysis of the above-mentioned views on competence and competency indicates that, at present, teaching biology in an interdisciplinary context embodies socio-cultural characteristics. Their interconnection contributes to the development of biological relationships within the "nature–society–human" system.

According to M.K. Shirinov, enriching natural science curricula and textbooks with new educational materials, instilling scientific understanding of the evolution of nature, society, and humans, and improving methodological support for teaching biology based on the principles of continuity and consistency are among the most pressing issues.

In the didactic views of Johann Amos Comenius, the educational process is presented as systematic and sequential. He argued that pedagogical principles must be harmonized and that education should begin in early childhood, taking into account the learner's age. He scientifically justified that pedagogy should be grounded in the laws of nature: just as nature prepares material before shaping it, education must follow a gradual and consistent progression. According to him, any formation begins with general principles and ends with specificity, and nature does not make leaps but advances step by step.

Conclusion

According to Konstantin Ushinsky, education offers a holistic scientific system based on studying and revealing all complex aspects of a child's comprehensive development, including interactions with natural and social environments. This system is closely connected with national identity, as traditions and customs are rooted in human interaction with nature. He emphasized that due to historical development and natural conditions, each nation forms its unique characteristics, which contribute to enhancing biological knowledge, including the ability to perceive, appreciate, and creatively engage with nature.

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The level of motivation is determined by the extent to which social needs are reflected in an individual's motives. One of the most essential needs of modern humanity is the preservation of nature as the source of life and survival. This process requires conscious human activity and the alignment of all actions with rational perspectives, transforming it into a vital and indispensable necessity.

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