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METHODOLOGICAL OPPORTUNITIES OF TEACHING NATURAL SCIENCES USING AN INTEGRATIVE APPROACH IN THE PROCESS OF PROFESSIONAL DEVELOPMENT

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Abstract

This article focuses on the classification of methodological tools for teaching natural sciences based on an integrative approach in the process of professional development. It aims to reveal the importance of competencies developed in the process of fostering scientific and critical thinking.

Keywords

STEAM education, natural sciences, scientific thinking, critical thinking, reflection, professional activity, creativity skills, intercultural skills, global awareness.

In the new standards, emphasis should be placed not on memorizing scientific facts but on understanding and applying them in practice. Engineering skills should be placed on the same level as scientific methods of cognition. The core ideas of engineering and technological education should have equal status with the core ideas of natural sciences. These ideas should be developed from preparatory groups to graduating classes.

In institutions of continuous professional development, the fundamental change in the content of training natural science teachers is connected with changes in identified educational paradigms. This requires a completely new methodology for organizing the readiness of natural science teachers for innovative activity—particularly developing 21st-century competencies (communication, creativity, collaboration, critical thinking, digital literacy, lifelong learning), analyzing international best practices, and establishing a teaching system based on innovative approaches. These priorities are outlined in the Decree of the President of the Republic of Uzbekistan No. PF-60 of January 28, 2022, *On the Development Strategy of New Uzbekistan for 2022–2026*, and other regulatory legal documents [2].

Accordingly, the problem of preparing subject specialists, including natural science teachers, for innovative professional activity—independently, creatively,

and practically—should remain at the center of research in the methodology of teaching natural sciences as well as in pedagogical, psychological, and methodological fields.

Changes in quality and high efficiency in education depend on their compliance with the requirements of global research and educational institutions, as well as on the extent to which the competencies developed in future teachers are applied in their professional activities.

In his Address to the Oliy Majlis on December 29, 2020, the President of the Republic of Uzbekistan stated:

"In the development of society, the decisive role belongs to the younger generation, which will ensure its future by growing up healthy and well-rounded. Therefore, in expanding the scope and effectiveness of our reforms, we rely on our determined, proactive youth, who have mastered modern knowledge and skills."

This, in turn, implies the necessity of organizing educational processes based on best practices and creating conditions for students to demonstrate their strengths and capabilities. In this regard, education based on an interactive approach is considered one of the key factors.

In the process of continuous professional development, organizing education aimed at developing the competencies of natural science teachers requires implementing innovative activities—opportunities, practices, and productive results aimed at introducing new developments into practice.

The concept of innovation is defined in the *National Encyclopedia of Uzbekistan* as follows:

"Innovation (from the English *innovation*)—meaning invention or introduced novelty—refers to:

- Funds invested into the economy to ensure the replacement of generations of technology and techniques;
- Novelties in areas such as technology, engineering, labor organization, and management based on advanced practices and scientific–technical achievements, as well as their application in various fields of activity."

Innovative activity is not only the ability to solve a specific set of problems within a system of interactions between social subjects aimed at improving socio-cultural objects, but also possessing the motivational readiness to solve problems in any situation.

Thus, implementing a competency-based approach on the basis of innovative activities helps students to effectively use the knowledge, skills, and abilities they have acquired as active members of society.
In this research, recommendations were developed for using the following effective

methods that contribute to carrying out innovative activities in teaching natural sciences:

The **"Continuous Relay of Ideas"** method involves logically continuing a given idea or thought. The learner is expected to express opinions on the topic or issue under study, moving from simple conclusions to analytical ones, and providing justification. For example, when revising the chapter *"General Biological Laws of the Biosphere Level of Life"*, this method can be applied. Students might say:

- *"The biosphere is an integral system encompassing all living organisms on our planet and their habitats…"*
- *"The biosphere is the highest level of life…"*
- *"The biosphere is a vast biosystem composed of diverse components that are closely interconnected…"*
- *"In the biosphere, living matter differs from non-living matter…"*
- *"The cyclical circulation is a crucial factor that ensures the existence of the biosphere, maintaining its integrity and stability…"*

For each statement, students provide supporting arguments and evidence.

In conclusion, it should be emphasized that compared to traditional teaching methods, the STEAM approach in secondary schools encourages children to conduct experiments, build models, independently create music and films, turn their ideas into reality, and produce final products. This educational approach enables students to effectively combine theoretical and practical skills, making it easier for them to enter university and continue their studies.

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