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Forms Of Developing Students' Environmental Competence Based On An Integrative Approach

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Abstract: This study examines the effectiveness of an integrative approach to developing students' environmental competence in higher education through the systematic application of contemporary educational technologies. The research is grounded in the didactic integration of biological, ecological, and social knowledge and is aimed at enhancing students' cognitive activity, independence, and professional readiness. The methodological framework includes learner-centered, developmental, activating, and formalized learning technologies, as well as dialogic instruction, coaching, problem-based learning, concept construction, and project-based learning. The results demonstrate that the integrative use of these technologies significantly increases learning motivation, promotes theoretical and systemic thinking, and facilitates the formation of key competencies such as goal setting, planning, forecasting, and self-assessment. The study confirms that integrative education creates favorable conditions for meaningful knowledge acquisition and the development of a holistic worldview, thereby ensuring the effective formation of environmental competence among students.

Keywords: Integrative approach; environmental competence; educational technologies; higher education; problem-based learning; project-based learning; learner-centered education.

Introduction: Educational technologies play a crucial role in shaping the educational process by determining the nature of learning activities, the degree of students' independence in knowledge acquisition, and the formation of learning skills. In contemporary higher education, particularly in the teaching of biology, microbiology, and ecology, there is a growing need for integrative approaches that combine content from multiple disciplines to address complex environmental problems.

The integrative approach in education emphasizes the interconnection of biological, ecological, and social knowledge, enabling students to develop environmental competence as a holistic personal and professional quality. This approach requires the application of educational technologies that consider psychological mechanisms of personality development and promote active, meaningful, and independent learning. Therefore, the present study focuses on the selection and implementation of effective educational technologies and teaching methods within a didactic system aimed at developing students' environmental competence through integrative education.

METHODS

The methodological basis of the study involves the application of a complex of educational technologies aligned with the principles of integrative and personality-oriented education. The following instructional technologies were employed: learner-centered, developmental, activating, and formalized learning technologies.

Learner-centered educational technology was used to ensure the personalization of learning and the recognition of students' individual cognitive, emotional, moral, and creative characteristics. This approach emphasizes the formation of personal meaning in educational content and supports holistic personality development.

Developmental education technology was implemented to foster students' theoretical thinking

through the mastery of mental actions such as analysis, planning, abstraction, and generalization. Instruction was organized according to the principle of movement from abstract concepts to concrete applications. Activating learning technology, including problem-based learning, was applied to enhance learning motivation and cognitive activity. Problem situations were deliberately created to stimulate independent thinking and exploratory behavior.

Formalized learning technology was used to regulate and structure educational and cognitive activities through clearly defined stages, including motivation, comprehension, verbalized action, internalization, and algorithmization.

In addition, a variety of teaching methods were incorporated into the didactic system, including dialogic instruction, coaching, problem questioning, concept construction, and project-based learning. These methods were selected based on instructional objectives, principles of integrative education, and criteria for environmental competence development, while also considering students' age, life experience, and psychophysiological characteristics.

RESULTS

The implementation of integrative educational technologies and methods led to increased student engagement and the development of key components of environmental competence. Dialogic teaching facilitated reflective and critical thinking through parity-based interaction among students. Coaching methods supported the activation of students' internal potential and encouraged independent problem-solving.

The use of problem questions and problem situations stimulated cognitive contradictions that motivated students to seek new knowledge and apply interdisciplinary approaches.

Concept construction activities resulted in the creation of original interdisciplinary definitions and educational products, demonstrating students' ability to synthesize knowledge from multiple domains.

Project-based learning significantly enhanced students' motivation, communication skills, systemic thinking, and ability to apply theoretical knowledge to practical environmental problems. Students demonstrated improved competencies in goal setting, planning, forecasting, and self-assessment, which are essential for professional environmental activity.

DISCUSSION

The findings confirm that the integrative application of learner-centered, developmental, activating, and formalized educational technologies creates favorable conditions for the development of environmental competence in higher education students. The combination of dialogic, problem-based, and project-oriented methods ensures students' active involvement in the learning process and supports the formation of a holistic worldview.

The principle of freedom of choice in selecting project topics and learning strategies plays a decisive role in enhancing personal responsibility and intrinsic motivation. Moreover, the interdisciplinary nature of integrative courses addresses the complexity of real-world environmental issues and prepares students for professional decision-making.

Overall, the didactic system based on an integrative approach proves to be an effective means of developing environmental competence and can be recommended for implementation in ecological and biological education programs.

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