JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS
GERMAN INTERNATIONAL JOURNALS COMPANY
ISSN: 2751-4390
IMPACT FACTOR (RESEARCH BIB) : 9,08. Academic research index

METHODOLOGY FOR TEACHING BIOLOGY IN ACADEMIC LYCEUMS BASED ON AN INTEGRATIVE APPROACH

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Abstract: This article discusses the methodology of teaching biology in academic lyceums using an integrative approach. It highlights the importance and role of integration processes in education and explores how transforming existing elements into new forms enables effective development of an individual's professional competence.

Keywords: integrative approach, academic lyceum, technological integration, methodological component, interdisciplinary integration, intra-subject integration, differentiation, content component, innovative lesson.

Introduction Current education reforms aim to deepen student mastery of knowledge, skills, and competencies, encouraging independent thinking and real-world problem solving. In this context, organizing education based on an integrative approach is of vital importance. In biology instruction at academic lyceums, integrative methodologies promote deeper understanding and connect the subject to real life.

Literature Review Educational goals are shifting from mere knowledge acquisition toward competency formation and student-centered learning. Modern information technologies enable teaching phenomena at micro and macro levels using computer graphics and modeling, and presenting rapid or very slow physical, chemical, and biological processes in compressed time frames [1].

In academic lyceums, integrative technologies—especially ICT—facilitate academic subject integration, intellectualize learning, accelerate integrative processes, and improve infrastructure and management systems [2]. Western scholars such as A. Berglund, D. Geladze, H. Long, M. Sugata, K. Whattananarong, P. Alfred, B. Means, W. Olatokun, K. Peters, J. Traxler, B. Furuholt, and others have made invaluable contributions to studying integration and ICT in education [2]. Recently, implementing communication and information technologies widely in education has become increasingly important [3]. When pedagogical and ICT tools are used appropriately in biology instruction, students develop critical thinking, strive for knowledge, love of their homeland, environmental awareness, and moral integrity.

Teachers must master modern ICT skills—a necessity in the XXI st-century ICT era. However, despite wide reforms and facilities in schools, some teachers still lack sufficient ICT knowledge, which negatively affects lesson effectiveness [4,5]. Research also addresses both the positive and negative ecological and social impacts of rapidly growing information technologies on personal development, particularly their influence on younger generations [6,7].

Review of the literature shows that mastering ICT knowledge among educators conducting research in biology is one of today's pressing issues.

Research Methodology The study involved analyzing scientific, methodological, and psychopedagogical works on biology teaching. It identifies the theoretical foundations of ICT integration in biology instruction in academic lyceums, studies distinctive features of such integration, and summarizes results from pedagogical experiments. The use of ICT in lectures and labs—such as micro- and macro-preparations, cellular structure, evolutionary systems—allows students to systematically study biological systems through simulations and interactive visualizations.

Analysis and Results Teaching biology in academic lyceums via an integrative approach promotes not only personal development but also increases student motivation toward the subject. The integrative approach is a pedagogical method that enables students to combine knowledge across disciplines into coherent, holistic understanding. It helps students perceive both individual subjects and interdisciplinary connections, thus enhancing analytical, generalization, and logical thinking skills [8,9].

In biology, integrative connections include:

Chemistry: biochemical processes, cellular metabolism

Physics: bio-potentials, circulation physics, respiration mechanisms

Geography: ecosystems, the biosphere, ecological factors

Informatics: basics of bioinformatics, genetic databases

History: history of biology, scientific discoveries

The aim of integrative teaching is to link biological knowledge with real life, foster interdisciplinary analysis, encourage independent research, and develop complex problem-solving skills.

Key Methodological Approaches Problem-Based Learning (PBL):

Encourages independent thinking, analysis, and problem-solving.

Teachers present a problem and guide rather than provide ready-made answers.

Stages: problem presentation, analysis, hypothesis formation, solution search, conclusion, application.

Benefits: fosters independence, increases interest, develops practical and collaborative skills.

Project-Based Learning (PBL):

Students work in groups on real-world biological projects—e.g., environmental issues, genetics, public health—blending subjects to solve real problems.

Benefits: develops XXI st-century skills, critical thinking, collaboration, and creativity; gives concrete outcomes and reflective learning.

Case-Study Method:

Involves analyzing real or simulated scenarios to develop decision-making and problem-solving skills.

Benefits: encourages active participation, application of theory to practice, teamwork, analytical and creative thinking.

Inquiry-Based Learning:

Students conduct independent research, experiments, and observations.

Examples: analyzing ATP synthesis from cellular energetics;

biodiversity monitoring;

DNA analysis using BLAST/GenBank; physiological impacts of temperature.

Advantages of Integrative Approach

Enhances logical and analytical thinking

Promotes a holistic worldview through interdisciplinary understanding

Improves retention via connected learning

Develops research and real-world problem-solving skills

Conclusion

Using an integrative approach in teaching biology at academic lyceums facilitates deep, systematic, and applied learning. It helps students develop competencies to analyze and resolve biological and ecological issues in real life. Therefore, biology teachers should employ integrative, interactive, problem-based, and project-based pedagogical methods in their lessons.

References

1.Karimov B.K. Biology teaching methodology, Tashkent, 2021.
2.Khodjayev M. Pedagogical technologies, Tashkent, 2019.
3.OECD. Integrative approaches in education: Benefits and strategies, 2020.
4.Ibodova M.N. “Conceptual foundations of teaching biology in academic lyceums based on an integrative approach”, Education and innovative research, 2024 No. 5, pp. 213–215.
5.Ibodova M.N. “Methodological system for organizing the use of integrative technologies in teaching biology in academic lyceums”, Continuous education, Tashkent, 2023 No. 6, pp. 126–129.
6.Ibodova M.N. Conceptual framework for the use of integrative technologies for teaching biological sciences in academic lyceums, European Journal of Research and Reflection in Educational Sciences, vol11, no4 (2023), pp.52–55.
7. Ibodova Mahfuza Namozovna. "Effectiveness of independent work in the educational process." ACADEMICIA: An International Multidisciplinary Research Journal, vol11, no10 (2021), pp.322–326.
8. Ricky Lewis (2003), Multifactorial Traits, McGraw-Hill Higher Education.
9.Virginia Proud & Helen Roberts (31 December 2005), "Medical Genetics: Multifactorial Inheritance", Children's Hospital of the King's Daughters.
10. Multifactorial Inheritance, Pregnancy and Newborn Health Education Center, The March of Dimes (archived).