

METHODOLOGY FOR THE INTEGRATIVE DEVELOPMENT OF STUDENTS' ECOLOGICAL AND VALEOLOGICAL COMPETENCIES THROUGH BIOLOGY EDUCATION IN GENERAL EDUCATION SCHOOLS

Ro'ziyeva Muhayyo Erkinovna

Professor (PhD), Department of Psychology and Sports, Mamun University

Raximova Mohinur Ho'sinboy qizi

Biology teacher, General Secondary School No. 7, Bog'ot District

ABSTRACT: This paper outlines a methodology for the integrative development of students' ecological and valeological competencies during biology instruction in general education schools. It proposes a methodological model, together with its implementation stages, pedagogical conditions, and diagnostic criteria, designed to link ecological knowledge with knowledge and practical skills related to health preservation. The model aims to ensure the continuity and coherence of lessons, practical sessions, and extracurricular activities.

Keywords: biology education, ecological competence, valeological competence, integrative approach, methodological model, project, monitoring.

INTRODUCTION: Under competency-based education, it is important for students not only to acquire knowledge but also to apply it in real-life situations, make independent decisions, and demonstrate responsible behavior. Ecological competence encompasses a conscious attitude toward nature and the environment, whereas valeological competence includes knowledge, skills, and values related to maintaining and strengthening health. Because of the close relationship between humans, nature, and health, these two areas should be studied in an integrated manner in biology education.

In practice, activities related to environmental education and a healthy lifestyle may be limited to certain topics or events. As a result, students may experience difficulties in applying the knowledge they acquire to everyday situations. From this perspective, there is a need to organize biology lessons, laboratory work, project activities, and extracurricular sessions on the basis of a unified methodological approach.

The aim of the study is to substantiate a methodology for the integrative development of ecological and valeological competencies in biology education and to determine its components, implementation stages, and assessment criteria.

The methodological basis of the study consists of competency-based, systemic, and integrative approaches. In preparing the thesis, the methods of analyzing and generalizing pedagogical and methodological literature, classifying biology topics according to their ecological and valeological content, and methodological modeling were used. The

proposed solution is theoretical and methodological in nature; no claims are made concerning experimental trials or statistical results.

The methodology is based on the following principles: continuity, orientation toward real-life situations, student activity, interdisciplinary integration, safety, and reflection. The content is selected by linking topics such as ecosystems, biodiversity, pollution, the human organism, nutrition, physical activity, hygiene, and disease prevention.

RESULTS: The analysis resulted in a four-component model of the methodology: target, content, process, and diagnostic-result components. The target component defines the expected competencies; the content component enriches biological knowledge with ecological and valeological issues; the process component organizes learning activities step by step; and the diagnostic-result component serves to determine the level of development.

Component	Main content	Form of implementation
Target	Responsible attitude toward nature and conscious decisions concerning health preservation.	Defining learning outcomes and indicators.
Content	Ecology, human physiology, hygiene, and healthy lifestyle content.	Inter-topic and interdisciplinary integration.
Process	Motivation, inquiry, practical activity, and reflection.	Cases, experiments, observation, projects, excursions.
Diagnostic-result	Knowledge, practical skills, and value-based attitude.	Tests, observation, portfolio, practical tasks.

Table 1. Components of the integrative methodology

The methodological process is organized in three interconnected stages. First, a problem situation is used to arouse students' interest and activate their prior knowledge. At the next stage, students engage in practical activities through observation, experimentation, data analysis, or project work. Finally, the results are discussed, personal conclusions are drawn, and subsequent activities are planned.

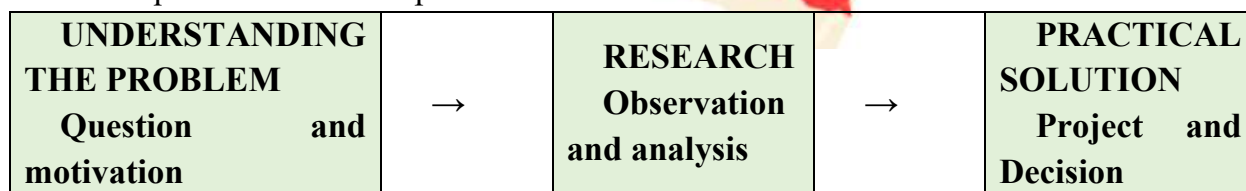


Figure 1. Process diagram of the methodology for developing competencies

Three criteria are recommended for assessing competencies: cognitive (knowledge), activity-based (practical application), and value-motivational (responsible attitude). Initial, intermediate, and advanced levels are determined for each criterion.

Criterion	Initial	Intermediate	Advanced
Cognitive	Recognizes concepts.	Explains relationships.	Applies knowledge in a new situation.
Activity-based	Performs with guidance.	Collects information and draws conclusions.	Proposes an evidence-based solution.
Value-based	Acts with reminders.	Demonstrates responsible habits.	Takes initiative and cooperates.

Table 2. Levels for assessing competencies

DISCUSSION: An integrative approach enables students to understand an environmental problem through its health-related consequences. For example, when studying air pollution, students can identify pollutants, discuss their effects on living organisms, and develop preventive recommendations. In such a task, biological knowledge, research skills, and a responsible attitude are demonstrated simultaneously.

The practical implementation of the methodology depends on teachers' ecological and valeological literacy, a bank of methodological tasks, a safe laboratory environment, interdisciplinary cooperation, and communication with parents. In schools with limited material resources, local observation, simple measuring instruments, reusable materials, and virtual laboratories can be used. It is important to take students' age characteristics and individual capabilities into account and, when addressing health topics, avoid moving into medical diagnosis or treatment recommendations.

The effectiveness of the proposed model should be tested through experimental research in subsequent studies, by comparing initial and final diagnostic tools and determining the reliability of the assessment criteria. Therefore, in this thesis, the expected capabilities of the model are theoretically substantiated and are not interpreted as empirical results.

CONCLUSION: The integrative development of ecological and valeological competencies in biology education contributes to connecting students' knowledge with everyday life activities. The proposed methodology combines goals, content, activities, and diagnostics into a unified system. It is recommended that the methodology be applied through a combination of lessons, practical sessions, projects, and extracurricular activities, with regular reflection and monitoring. The practical effectiveness of the model should be verified through specially organized experimental studies.

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