

ENHANCING ENVIRONMENTAL AWARENESS AND ECOLOGICAL COMPETENCE THROUGH FIELD-BASED BIOLOGY EDUCATION IN SECONDARY SCHOOLS

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Abstract

This article examines the educational significance of field-based biology instruction in developing ecological competence among secondary school students in grades 7–11. Particular attention is given to biological excursions as an interactive teaching approach that connects theoretical knowledge with direct environmental observation. The study discusses the potential of outdoor learning activities to strengthen ecological literacy, critical thinking, environmental responsibility, and practical problem-solving abilities. Drawing on established research in environmental education, the article identifies effective strategies for organizing biological excursions and integrating their outcomes into classroom instruction. It argues that systematic field-based activities can contribute to students' understanding of ecological relationships and encourage responsible attitudes toward natural resources.

Keywords: ecological competence, environmental education, biological excursions, secondary education, experiential learning, ecological literacy, outdoor learning, environmental responsibility.

Introduction

Environmental challenges, including climate change, biodiversity loss, ecosystem degradation, and pollution, have increased the importance of ecological education in secondary schools. Educational institutions are expected not only to provide scientific knowledge about natural processes but also to develop students' ability to recognize environmental problems and participate responsibly in their resolution.

Ecological competence represents an integrated combination of environmental knowledge, practical skills, values, and responsible behavior. Its development requires educational approaches that encourage learners to connect scientific concepts with environmental conditions.

Biology provides opportunities for developing ecological competence because it examines living organisms, ecosystems, biodiversity, and interactions between organisms and their surroundings. However, classroom-based instruction alone may not fully demonstrate the complexity of ecological relationships.

Biological excursions offer an alternative learning environment where students can directly observe ecosystems, collect information, identify environmental changes, and evaluate human impacts on nature.

Kolb (1984) emphasizes the importance of experience and reflection in meaningful learning. This perspective provides a theoretical foundation for integrating field observations into biology instruction.

The Educational Role of Biological Excursions

Biological excursions are organized educational activities conducted in natural environments such as forests, parks, riversides, agricultural landscapes, and protected areas. Their primary purpose is to strengthen students' scientific understanding through observation and practical investigation.

For students in grades 7–9, excursions may focus on identifying plant and animal species, observing seasonal changes, examining food chains, and understanding ecological relationships. These activities establish foundational ecological knowledge and develop observation skills.

Students in grades 10–11 can undertake more advanced investigations involving biodiversity assessment, environmental monitoring, ecosystem comparison, and analysis of anthropogenic influences.

Such differentiation allows excursion activities to correspond with students' cognitive development and curriculum requirements.

Rickinson et al. (2004) identified educational benefits associated with outdoor learning, including improvements in knowledge, skills, and attitudes, while emphasizing that outcomes depend on the quality of educational organization. Therefore, biological excursions should be carefully planned and connected with clearly defined learning objectives.

Strategies for Developing Ecological Competence

The effectiveness of biological excursions depends on their integration into a structured educational process involving preparation, field investigation, and reflection.

Before excursions, teachers should introduce ecological concepts, explain research objectives, establish safety requirements, and provide observation guidelines.

During field activities, students may complete ecological observation sheets, record species diversity, investigate environmental conditions, and identify potential sources of pollution.

After returning to the classroom, students should analyze their findings, compare observations, discuss environmental challenges, and formulate recommendations for ecological protection.

For example, students investigating a local water ecosystem may examine visible pollution indicators, identify surrounding vegetation, and discuss the consequences of human activities for aquatic organisms.

These activities can support analytical thinking and help students understand connections between environmental processes and human behavior. According to UNESCO (2017), education for sustainable development should promote competencies that enable learners to participate in building sustainable societies.

Similarly, Ardoin, Bowers, and Gaillard (2020) demonstrate that environmental education research encompasses outcomes relating to knowledge, attitudes, skills, and environmental action.

Accordingly, evaluating ecological competence should involve more than traditional knowledge tests. Teachers may use observation records, project assignments, reflective journals, presentations, and practical environmental tasks.

Conclusion

Developing ecological competence through biological excursions represents a promising approach to strengthening environmental education in secondary schools. Field-based activities provide opportunities for students to apply biological knowledge, investigate ecological relationships, and develop responsible attitudes toward nature.

The educational effectiveness of excursions depends on appropriate planning, age-specific assignments, guided observation, and systematic reflection. Integrating these components into biology instruction can help transform environmental knowledge into practical understanding and informed decision-making.

For students in grades 7–11, regular biological excursions may contribute to ecological literacy, independent inquiry, and environmental responsibility. Future classroom-based research should evaluate their effectiveness using measurable indicators of ecological competence.

References

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