

THE ROLE OF OUTDOOR BIOLOGY EDUCATION IN DEVELOPING ECOLOGICAL LITERACY AND ENVIRONMENTAL RESPONSIBILITY AMONG SECONDARY SCHOOL STUDENTS

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Abstract

This article explores the role of outdoor biology education in developing ecological literacy and environmental responsibility among secondary school students in grades 7–11. It examines how biological excursions, field observations, and practical environmental investigations contribute to students’ understanding of ecosystems, biodiversity, and sustainable development. Particular attention is given to experiential learning, inquiry-based teaching, and reflective activities as effective approaches to ecological education. The article discusses the pedagogical principles of organizing biological excursions, adapting fieldwork to different age groups, and assessing students’ ecological competencies. Drawing on established research in environmental education, it argues that integrating outdoor learning with classroom instruction can strengthen students’ scientific knowledge, critical thinking, problem-solving abilities, and environmental awareness. The article also emphasizes the importance of systematic planning, interdisciplinary cooperation, and practical conservation activities in promoting environmentally responsible behavior.

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

Introduction

Environmental problems have become increasingly significant in contemporary society, requiring educational institutions to reconsider their approaches to environmental education. Climate change, biodiversity loss, pollution, desertification, and the depletion of natural resources demonstrate the importance of developing ecological awareness among younger generations.

Secondary schools play an essential role in preparing students to understand environmental challenges and participate in sustainable development. Biology education is particularly important because it introduces learners to living organisms, ecological systems, natural processes, and relationships between humans and the environment.

However, theoretical instruction alone may not provide sufficient opportunities for students to develop practical ecological skills. Students need direct contact with natural environments to observe ecological processes, investigate environmental conditions, and understand the consequences of human activities. Biological excursions represent an effective educational approach for connecting classroom knowledge with practical experience. Through organized field activities, students can observe biodiversity, identify ecological relationships, investigate environmental problems, and develop a deeper appreciation of nature.

According to Kolb (1984), experiential learning involves transforming experience into knowledge through reflection and conceptual understanding. This theoretical perspective supports the integration of outdoor activities into biology instruction.

The purpose of this article is to examine the pedagogical potential of outdoor biology education in developing ecological competence among students in grades 7–11 and identify effective approaches to organizing biological excursions.

Theoretical Foundations of Ecological Competence

Ecological competence can be understood as an integrated system of knowledge, skills, values, and behavioral orientations that enables individuals to understand environmental processes and make environmentally responsible decisions.

Its development involves several interconnected dimensions. The cognitive dimension includes knowledge of ecosystems, biodiversity, environmental protection, and sustainable resource management. The practical dimension involves observation, investigation, data collection, and ecological problem-solving.

The value-oriented dimension reflects students' attitudes toward nature, while the behavioral dimension concerns their willingness and ability to participate in environmental protection activities.

UNESCO (2017) emphasizes that education for sustainable development should develop competencies such as critical thinking, systems thinking, collaboration, and responsible decision-making.

These competencies are closely connected with ecological education because environmental problems often involve complex relationships between natural and social systems.

Consequently, ecological competence should not be evaluated exclusively through theoretical examinations. Practical activities, reflective assignments, and environmental projects are also important indicators of students' learning progress.

Biological Excursions as an Effective Educational Method

Biological excursions provide opportunities for students to study natural environments through direct observation and scientific investigation.

Unlike traditional classroom activities, outdoor education allows learners to interact with real ecosystems and observe biological phenomena in their natural contexts.

For example, excursions to parks, forests, botanical gardens, agricultural areas, and water ecosystems can help students investigate plant diversity, animal habitats, ecological relationships, and environmental conditions.

Rickinson et al. (2004), in their review of outdoor learning research, identified benefits associated with well-organized outdoor educational experiences, including improvements in knowledge, understanding, and attitudes.

Biological excursions may also increase students' motivation by making scientific concepts more meaningful and relevant to everyday life.

During field activities, students can collect ecological information, compare natural objects, formulate hypotheses, and interpret observations. Such activities promote inquiry-based learning and independent thinking.

Moreover, group assignments encourage communication, cooperation, and shared responsibility for completing environmental investigations.

Age-Appropriate Organization of Biological Excursions

The effectiveness of outdoor biology education depends on adapting learning activities to students' developmental characteristics and educational needs.

For students in grades 7–8, biological excursions should primarily focus on developing observation skills and basic ecological knowledge. Suitable activities include identifying common plant species, observing insects, examining soil characteristics, and studying seasonal environmental changes.

Students in grade 9 can complete more complex assignments involving ecosystem interactions, food chains, biodiversity comparisons, and the identification of environmental threats.

For students in grades 10–11, excursions may involve independent investigations, environmental monitoring, research projects, and the evaluation of human impacts on ecosystems.

For instance, senior students may compare vegetation diversity in urban and rural environments or investigate environmental conditions around agricultural areas.

These assignments encourage learners to apply scientific methods and develop evidence-based conclusions.

Teachers should establish clear educational objectives before each excursion and provide students with appropriate observation instructions, research questions, and safety guidelines.

Integrating Fieldwork with Classroom Learning

Biological excursions are most effective when incorporated into a structured instructional process consisting of preparation, practical investigation, and reflection.

During the preparation stage, teachers introduce relevant ecological concepts and explain the objectives of the excursion.

The fieldwork stage involves direct observation, data collection, environmental investigation, and collaborative activities.

Following the excursion, students analyze their findings, prepare reports, discuss environmental problems, and propose possible solutions.

Reflective activities are particularly important because they help students connect practical experiences with theoretical knowledge.

Ardoïn, Bowers, and Gaillard (2020) demonstrate through a systematic review that environmental education can produce outcomes relating to environmental knowledge, attitudes, skills, and conservation-oriented actions.

Therefore, teachers should incorporate reflective journals, presentations, observation records, and practical projects into the assessment process.

For example, after investigating a local ecosystem, students may develop recommendations for reducing pollution, conserving biodiversity, or improving environmental conditions.

Such assignments can strengthen students' understanding of their individual and collective responsibilities toward environmental protection.

Conclusion

Outdoor biology education offers significant pedagogical opportunities for developing ecological competence among secondary school students. Biological excursions create meaningful connections between theoretical knowledge and practical environmental experience, enabling students to investigate ecosystems, recognize ecological problems, and understand the importance of biodiversity conservation.

The successful organization of excursions requires clearly defined objectives, age-appropriate activities, systematic observation, and reflective assessment. Integrating fieldwork into biology instruction can support scientific thinking, environmental awareness, collaboration, and responsible decision-making.

For students in grades 7–11, biological excursions should be regarded not merely as supplementary educational activities but as an important component of ecological education. Their systematic implementation can contribute to preparing environmentally literate individuals capable of participating in sustainable development initiatives.

Further empirical research is necessary to determine the effectiveness of specific excursion-based teaching strategies and develop reliable indicators for assessing ecological competence in secondary schools.

References

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