

SPECIES, POPULATION, ECOSYSTEM, AND BIOSPHERE: DEVELOPING STUDENTS' METHODOLOGICAL SKILLS IN TEACHING

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ANNOTATION: This article discusses the issues of developing students' methodological skills during the teaching of the "Species, Population, Ecosystem, and Biosphere" section of the biology curriculum. Methods for forming methodological skills such as systematic analysis of biological concepts, observation, comparison, modeling, and drawing conclusions are proposed. The article also highlights opportunities for developing students' scientific thinking through the use of modern educational technologies.

KEY WORDS: species, population, ecosystem, biosphere, methodological skills, scientific thinking, biology education.

INTRODUCTION

In the current education system, it is important to develop not only theoretical knowledge but also methodological skills inherent to scientific research activities in students. In particular, the 7th-grade biology course section "Species, Population, Ecosystem, and Biosphere" includes topics such as "Species, Populations, and Ecosystems. The Biosphere" and practical exercises like "Adaptation of Living Organisms to the External Environment" and "Constructing Food Chains and Food Webs."

Studying these topics introduces students to general biological concepts such as species, population, species criteria, symbiosis, ecosystem, biocenosis, biogeocenosis, biotope, producer, consumer, decomposer, food chain, biosphere, and boundaries of the biosphere. Through this section, students systematically develop evolutionary and ecological concepts, which provides great opportunities for fostering scientific thinking in biology.

Learning topics such as species, population, ecosystem, and biosphere helps students develop methodological skills such as observation in natural conditions, analysis, comparison, identifying cause-and-effect relationships, generalization, and drawing conclusions.

In biological education, the concepts of "species, population, ecosystem, and biosphere" are organized hierarchically. Through these topics, students gradually understand that a population is a living unit of a species, similar populations form a species, and learn about species criteria.

When teaching species and population topics, it is important to guide students to compare different organisms, identify general and distinctive traits, and analyze living conditions of different populations of the same species, explain genetic diversity with simple examples, and organize information using tables and diagrams. By studying species criteria, students learn that species are the smallest taxonomic units and gain knowledge about morphological, physiological, genetic, ecological, and ethological criteria, as well as about closely related species. These concepts help students develop analytical and generalization skills.

Topics on ecosystems and the biosphere require students to think broadly. For example, living organisms can survive within a certain range of environmental factors. The lower limit of a factor defines the minimum, and the upper limit defines the maximum. Deviation from these limits negatively affects organisms. The optimal range of environmental factors is the optimum zone, while areas outside this zone are considered unfavorable. The tolerance zone defines the limits within which organisms can survive. Understanding these concepts helps develop students' ecological literacy and methodological competence.

The study of the biosphere, based on modern concepts of the noosphere, plays an important role in scientific methodology and in studying natural phenomena. In the 21st century, developing students' methodological literacy is essential for both science and the sustainable interaction of society with nature.

Addressing issues of ecology and noospherogenesis requires scientific and methodological strategies to enhance students' methodological competence, which also supports decision-making skills.

In teaching these topics, students' scientific thinking is further developed through tasks such as modeling ecosystem components, analyzing food chains and matter cycles using diagrams, and evaluating human impacts on the biosphere.

Interactive methods such as clusters, conceptual maps, and brainstorming, along with project-based and problem-based learning, strengthen students' independent thinking. For example, a small project on "Modeling a Local Ecosystem" helps students develop research skills and gain a deeper understanding of the biocenosis in their own environment, as well as increasing their interest in studying its ecological state.

Developing methodological skills while teaching the "Species, Population, Ecosystem, and Biosphere" section of the 7th-grade biology course plays a crucial role in shaping students' scientific worldview. Organizing the content of this section in a systematic, interactive, and research-oriented way allows students to effectively develop skills in analysis, modeling, and drawing conclusions.

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