



## **NABT Position Statement**

### **Biology Teaching Preparation Standards for Middle and Secondary Teachers** (formerly Biology Teaching Standards)

A biology teacher's education program should be in alignment with the *National Science Education Standards* (NSES; National Academy of Sciences, 1996) and *Benchmarks for Science Literacy* (American Association for the Advancement of Science, 1993). The program should prepare pre-service teachers of secondary biology or life science courses in the areas of content, pedagogy and assessment. There has been, and continues to be, enormous growth and change in biological knowledge. Therefore, programs for pre-service teachers must include a professional development component that prepares teachers of the life sciences to remain current by further college instruction, reading professional journals, and attending conferences and workshops.

#### **Content Preparation**

Teachers of biology and life sciences must have a broad preparation science inquiry processes and in the content areas of cellular and molecular biology (cytology, cell physiology, macromolecules, bioenergetics and genetics), organismal biology (homeostatic mechanisms, developmental biology and behavior), and ecological and evolutionary biology (genetic variation, natural selection, speciation, extinction, systematics, interrelationships, population factors, ecosystems, energy flow, nutrient cycles, sociobiology, and environmental biology). Teachers should also know and understand the ethical implications of science and technology, basic technology tools, the historical development of biology, and how to incorporate and maximize field experiences.

Biology is deeply integrated with other science disciplines. An understanding of the interrelationship between the content of these disciplines is essential for a strong foundation in the teaching of biology. Pre-service programs should include preparation in the following science disciplines: mathematics (data analysis, statistics, probability, rates of change and spatial relationships), chemistry (atomic theory, isotopes, molecular properties, rates of reactions and factors affecting the rate of reaction, and energy transformations), geology (geological processes), and physics (electromagnetic forces, Newton's laws of motion, first and second laws of thermodynamics, and electricity). A science teaching preparation program must also provide the pre-service teacher with experiences that lead to an understanding of the nature of science. This preparation should include a knowledge of and experience in usage of basic research procedures, basic laboratory techniques (titrations, oxidation-reduction reactions, chemical equilibrium, preparing percent and molar solutions, and determining empirical formulas), and common technologies utilized in the laboratory.

#### **Pedagogy**

Proper pedagogy in biology education requires that the pre-service teacher have experience with scientific inquiry, establishing a safe and welcoming learning environment, classroom management, and the application of educational technologies. It is essential that pre-service teachers have the opportunity to experience and plan inquiry-based activities that meet the NSES

inquiry standard and experience a learning environment that emphasizes hands-on, experience-oriented activities. Pre-service teachers should receive instruction in the proper use of multimedia computers as a pedagogical tool and classroom management if a lab or field situation.

### **Assessment**

Assessment in inquiry-based classrooms must measure the student's ability to generate or clarify questions, construct investigations, formulate conclusions, and evaluate the process of science. Assessment that closely approximates the intended outcomes of science education is known as authentic assessment. Although other forms of assessment are useful, NABT believes that there is no substitute for authentic assessment. Pre-service biology teachers must experience and plan authentic assessments.

NABT has several other Policy Statements that relate directly to biology teacher preparation. NABT considers these policies to be essential to good teacher preparation and recommends that the principles in the following statements be incorporated teacher preparation programs just as though they were part of this statement:

- [Equity in Science Education](#)
- [Ethics Statement for Biology Teachers](#)
- [The Use of Animals in the Biology Classroom](#)
- [The Role of Laboratory and Field Instruction in Biology Education](#)

Adopted by the NABT Board of Directors, May 2004