

**Standards for the Preparation  
of Teachers  
Biology (DA)**



Adopted by the Michigan State Board of Education  
August 8, 2002

# **Standards for the Preparation of Teachers of Biology (DA Endorsement)**

## **Preface**

### **Development of the Proposal**

Over the last several years, a referent group of professional educators developed a proposal to adopt standards for the preparation of biology teachers. These standards align with standards developed by the National Science Teachers Association and the Michigan Curriculum Framework for science education. Teachers who receive the endorsement in biology would be prepared to teach any biology or life science course at their certificate level.

To provide information and gather feedback on the proposal, a copy was also forwarded to selected groups/organizations, all Michigan teacher preparation institutions, and a random sample of intermediate and local school districts for review and comment. As presented in this document, the standards reflect the feedback received.

State Board adoption of these standards typically leads to the creation of a new certification test for teachers prepared to teach this content area. Test development for a new Michigan Test for Teacher Certification in biology will be scheduled according to the recommendation of the Standing Technical Advisory Council.

### **Approval of Programs**

Teacher preparation institutions that wish to continue to offer programs to prepare biology teachers are required to submit an application for program approval that demonstrates how the new standards are met throughout the proposed curriculum. The programs must be re-approved to show compliance with the new standards. Following initial approval, the teacher preparation programs will be reviewed every five years through the Periodic Review/Program Evaluation process.

### **Proficiency Level**

Upon completion of an approved teacher preparation program in Michigan for Agricultural Education, a person recommended for the Michigan Standard certificate must meet the following proficiency level for each standard.

**The description of proficiency levels are:**

**A = Awareness: Possesses general knowledge of (exposure)**

**B = Basic: Ability to comprehend and apply (use)**

**C = Comprehensive: High level of understanding, application, and reflecting (proficient)**

These proficiency levels for each standard are indicated at the end of each standard in parenthesis.

Submit a narrative that explains how this program:

- A. uses the Michigan Curriculum Framework K-12 Science Content Standards and Benchmarks as the critical foundation for teacher preparation, ensuring that Biology teachers have the content knowledge and the ability to teach this curriculum; and
- B. develops an understanding of the interconnectedness of all science, including the major concepts of chemistry, the earth/space sciences, and physics, and relates this understanding to the teaching of biology and the life sciences.

## **The preparation of high school biology teachers will enable them to:**

- 1.0 understand the life sciences to include cellular functioning, the organization of living things, concepts of heredity, evolutionary changes, and ecological systems, as illuminated within Strand III of the Science Content Standards and Benchmarks found in the Michigan Curriculum Framework;
- 2.0 construct new knowledge by using research, reading and discussion, and reflect in an informed way on the role of science in human affairs; and
- 3.0 understand and develop the major concepts and principles of biology, including concepts in:
  - 3.1 Cellular Function, including
    - 3.1.1 cell theory (B)
    - 3.1.2 cell types (B)
    - 3.1.3 cell structure and function (C)
    - 3.1.4 protein synthesis (C)
    - 3.1.5 cell division (mitosis and meiosis) (C)
  - 3.2 Organization of Living Things, including
    - 3.2.1 life cycles (including sexual and asexual reproduction) (C)
    - 3.2.2 systems (C)
    - 3.2.3 classification (C)
    - 3.2.4 growth and development (B)
    - 3.2.5 photosynthesis (C)
    - 3.2.6 cellular respiration (C)
    - 3.2.7 living and nonliving (C)
  - 3.3 Concepts of Heredity, including
    - 3.3.1 Mendelian genetics (C)
    - 3.3.2 molecular genetics (structure of DNA) (C)
    - 3.3.3 modern genetics (electrophoresis, genetic engineering, DNA fingerprinting, etc.) (C)
    - 3.3.4 population genetics (B)

- 3.4 Evolutionary Changes, including
  - 3.4.1 diversity/speciation (B)
  - 3.4.2 adaptation and natural selection (C)
  - 3.4.3 fossils/ancient life (A)
  - 3.4.4 extinction (B)
- 3.5 Ecological Systems, including
  - 3.5.1 community relationships, including predator/prey and symbiosis (C)
  - 3.5.2 population (B)
  - 3.5.3 transfer of energy (food chains/webs) (C)
  - 3.5.4 biogeochemical cycles (C)
  - 3.5.5 human impact (C)
- 3.6 Human Biology, including
  - 3.6.1 anatomy and physiology (C)
  - 3.6.2 disease and immunology (B)
  - 3.6.3 health habits (B)
  - 3.6.4 resource management (B)
  - 3.6.5 human population growth and diversity (B)

**The preparation of high school biology teachers will enable them to:**

- 4.0 develop an understanding and appreciation for the nature of scientific inquiry;
- 5.0 relate the concepts of biology to contemporary, historical, technological and societal issues; in particular, relate concepts of biology to current controversies, such as those around cloning, medical research, and genetically-modified food, as well as other issues;
- 6.0 apply mathematics, including statistics, to investigations in biology/life sciences and the analysis of data;
- 7.0 understand and promote the maintenance of a safe science classroom as identified by the Council of State Science Supervisors, and including the ethical and appropriate use and care for living organisms and scientific equipment, and the safe storage, use, and disposal of chemicals;
- 8.0 locate resources, design and conduct inquiry-based open-ended investigations in biology, interpret findings, communicate results, and make judgments based on evidence;
- 9.0 demonstrate competence in the practice of teaching through investigative experiences by demonstrating the application of the scientific processes, and in assessing student learning through multiple processes;
- 10.0 create and maintain an educational environment in which conceptual understanding will occur for all science students; and

11.0 demonstrate competence in the practice of teaching as defined within the Entry-Level Standards for Michigan Teachers, as observed during the directed teaching experience.