

Endorsement Competencies for Biology 5-12

2007 Standards for Biology
1.0 Common Core – Content:
1.1 The Biology teacher knows and understands scientific concepts and principles that are needed to advance student learning as defined by state and national standards developed by the science education community, including major unifying themes. Content includes the big ideas of science and mathematics underlying them. This includes basic principles of earth and space science, chemistry, physics, and mathematics as they relate to biology.
1.1.1 Mathematics – Applications of mathematics in life science research, including: <ul style="list-style-type: none"> • Algebra. • Probability and statistics.
1.1.2 Knowing – Science is a way of asking and answering questions about the physical universe. <ul style="list-style-type: none"> • Scientific Investigation. • Other ways of knowing.
1.1.3 Ecosystems – Ecosystems, interdependent communities of living things, recycle matter while energy flows through them. <ul style="list-style-type: none"> • The interdependence of life: populations, communities, and ecosystems. • Mechanisms of environmental change. • Flow of matter and energy in the environment.
1.1.4 Strategies of Life – Living things use many strategies to deal with the problems of acquiring and using matter and energy. <ul style="list-style-type: none"> • The organization of living things. • Strategies of fungi. • Strategies of plants. • Strategies of animals.
1.1.5 Animal Biology with an emphasis on human anatomy and physiology – <ul style="list-style-type: none"> • Organ systems; structure. • Organ systems; function. • Organ systems; interdependencies. • Comparative anatomy. • Regulation of living systems.
1.1.6 Molecules of Life – A cell’s major parts are constructed from a few simple molecular building blocks. <ul style="list-style-type: none"> • Characteristics of organic molecules. • Amino acids and the structure of proteins. • Nucleotides • Carbohydrates • Lipids • Vitamins and minerals
1.1.7 The Living Cell – Life is based on chemistry, and chemistry takes place in cells. <ul style="list-style-type: none"> • The nature and variety of cells.

<ul style="list-style-type: none"> • How a cell works. • Metabolism and energy transfer: photosynthesis, glycolysis, respiration.
<p>1.1.8 Genetics – All living things use the same genetic code to guide chemical reactions in every cell.</p> <ul style="list-style-type: none"> • Classical genetics: qualitative and quantitative. • DNA and RNA. • Cell division: mitosis and meiosis. • The genetic code. • Genetic engineering, gene therapy.
<p>1.1.9 Evolution – All life of Earth evolved from single-celled organisms by the process of natural selection.</p> <ul style="list-style-type: none"> • Basis of biological diversity. • The diversity of life on earth. • Genetic variation within a species. • Evidence of evolution. • Adaptation and natural selection. • Changes in diversity over time.
<p>1.1.10 The biology teacher is able to:</p> <ul style="list-style-type: none"> • Conduct limited but original research in biology, demonstrating the ability to design and conduct open-ended investigations and report results. • Classify organisms into distinct groups according to structural, cellular, biochemical, and genetic characteristics. • Explain that specific genes regulate the functions performed by structures within the cells of multicellular organisms. • Describe how genetic information (DNA) in the cell is controlled at the molecular level, and provides genetic continuity between generations. • Compare and contrast the specialized structural and functional systems that regulate growth and development, and maintain health. • Explain that fossils and radioactive elements can be used to correlate and determine the sequence of geologic events. • Investigate and examine the scientific evidence used to develop theories for evolution, speciation, adaptation, and biological diversity. • Explain how organisms can sustain life by obtaining, transporting, transforming, and releasing matter and energy. • Compare and contrast the complex factors (biotic and abiotic) that affect living organisms, interactions in biomes, ecosystems, communities, and populations. • Analyze the effects of natural events and human activities on the earth's capacity to sustain biological diversity.
<p>1.2 Inquiry - The Biology teacher knows and understands:</p> <ul style="list-style-type: none"> • Scientific inquiry. • Application of science knowledge and skills to solve problems or meet challenges.
<p>1.2.1 The biology teacher is able to demonstrate abilities necessary to do scientific inquiry in the following areas: questioning, designing, and conducting investigations, explanation, modeling (including mathematical modeling) and communication in</p>

biological investigations to include:

- Questioning and formulating solvable problems.
- Reflecting on and constructing, knowledge from data.
- Collaborating and exchanging information while seeking solutions.
- Developing concepts and relationships from empirical experience.
- Apply science knowledge and skills to solve problems or meet challenges: identifying problems, designing or testing solutions, evaluating potential solutions in biological challenges at local, national, or global level.

1.3 Nature and Context of Science - The biology teacher knows and understands:

- The nature of scientific inquiry in the context of life sciences including intellectual honesty, limitations of science and technology, dealing with inconsistencies, evaluating methods of investigation, and evolution of scientific ideas.
- That science and technology are human endeavors, interrelated to each other, to society, and to the workplace in the context of the life sciences (e.g. all peoples contribute to science and technology, science and technology are interrelated, many careers and occupations use science, mathematics, and technology).
- The unifying themes common to all science, including systems, order and organization; evidence, models and organization; constancy, changes and measurement; evolution and equilibrium; and form and function.

1.4 The biology teacher is able to:

- Use processes and conventions of science as a professional activity.
- Use standards defining acceptable evidence and scientific explanation.
- Explain the nature of scientific inquiry including intellectual honesty, limitations of science and technology, dealing with inconsistencies, evaluating methods of investigation, and evolution of scientific ideas.
- Explain that science and technology are human endeavors, interrelated to each other, to society, and to the workplace (e.g., all peoples contribute to science and technology, science and technology are interrelated, many careers and occupations use science, mathematics, and technology).

1.5 The biology teachers know the relationship between life science and the daily lives and interests of students and to a larger framework of human endeavor and understanding. The context of science refers to:

- Knowing how science and technology interact with society.
- Knowing how values are used in scientific, technological, personal, social, and cultural contexts.
- Knowing the relevance and importance of life science to the personal lives of students.

1.6 Biology teachers relate life science to the daily lives and interests of students and to a larger framework of human endeavor and understanding. The context of science refers to:

- Enabling students to recognize relationships between science and technology and society.
- Enabling students to recognize the use of values in scientific, technological, personal, social, and cultural contexts.

<ul style="list-style-type: none"> • Being able to demonstrate the relevance and importance of science to the personal lives of students.
<p>2.0 Common Core – Instructional Methodology:</p>
<p>2.1 Skills of Teaching: Biology teachers know the equipment, materials, and preparation required in the biology laboratory, including:</p> <ul style="list-style-type: none"> • Design of controlled investigations • Data analysis and presentation • Preparation of laboratory reports • Operation of equipment • Preparation of materials • Lab safety (including storage and disposal of hazardous waste)
<p>2.1.1 Biology teachers, incorporating instructional materials, create a community of diverse student learners who can construct meaning from science and possess a disposition for further inquiry and learning. Skills of Teaching refers to:</p> <ul style="list-style-type: none"> • Able to use science teaching actions, strategies, and methodologies. • Able to establish interactions with students, including questioning techniques, that promote learning and achievement. • Able to effectively organize classroom, laboratory, and field experiences in different student groupings. • Able to use advanced technology to extend and enhance learning. • Able to use prior conceptions and student interests to promote new learning. • Able to design experiments for biology. • Able to analyze and present data in biology. • Able to prepare laboratory reports in biology. • Able to operate biology laboratory equipment. • Able to prepare materials used in the biology laboratory. • Able to establish and enforce lab safety (including storage and disposal of hazardous waste) in the physical science laboratory. • Monitor students’ understanding of content through a variety of assessment strategies, provide feedback to students to assist learning, adjust instruction and encourage students to learn to work together to solve problems. • Being able to use advanced technology to extend and enhance learning. • Design, conduct, and evaluate laboratory activities that target the development of science concepts, using techniques, equipment, and facilities that meet current technological standards including computer applications to science teaching and hands-on laboratory experiences, equipment, and laboratory notebook. • Being able to use prior conceptions and student interests to promote new learning. • Integrate reading, writing, communication, mathematics, social studies, and health/fitness into the teaching of biology.
<p>2.2 Curriculum – Biology teachers know the biology curriculum.</p> <ul style="list-style-type: none"> • Understand the application of student learning goals to design lessons that target state standards (i.e., read with comprehension, write with skill, and communicate effectively with responsibility in a variety of ways and settings, know and apply the core concepts).
<p>2.2.1 The biology teacher develops and applies a coherent, focused biology curriculum</p>

that is consistent with state and national standards for biology education and appropriate for addressing the need, abilities, and interests of students. Curriculum refers to:

- Select, analyze, and modify materials to meet the instructional needs and levels of diverse learners.
- Being able to develop and apply an extended framework of goals, plans, materials, and resources for instruction.
- Being able to develop instructional context, both in and out of school, within which pedagogy is embedded.
- Plan instruction based upon:
 - Knowledge of subject matter.
 - Promotion of higher order thinking.
 - Needs of local students and the community.
 - Washington Essential Academic Learning Requirements (EALRs).
 - Application in the workplace and career opportunities of life science.
 - Application of life science to society, economics, and in peoples' daily lives.
 - Plan instruction to include use of student learning goals in the context of the life sciences (i.e., read with comprehension, write with skill, and communicate effectively and responsibly in a variety of ways and settings, know and apply the core concepts) in the national standards.

2.3 Social Context - Biology teachers know the relation between science and the community and know the human and institutional resources in the community. The social context of science teaching refers to:

- Knowing examples of social and community support networks within which occur life science teaching and learning.
- Knowing the relationship of science teaching and learning to the needs and values of various communities.

2.3.1 Biology teachers can relate science to the community and to use human and institutional resources in the community to advance the education of their students in life science. The social context of science teaching refers to:

- Being able to develop the social and community support network within which science teaching and learning occur.
- Being able to relate science teaching and learning to the needs and values of the community.
- Being able to involve people and institutions from the community in the teaching of science.

2.4 Assessment - The biology teacher knows a variety of contemporary assessment strategies to evaluate the intellectual, social, and personal development of the learner in all aspects of earth science. Assessment refers to:

- Knowing the measurement and evaluation of student learning in a variety of dimensions including state assessments.

2.4.1 The biology teacher uses a variety of contemporary assessment strategies to evaluate the intellectual, social, and personal development of the learner in all aspects of science. Assessment refers to:

- Identifying outcomes to be measured.

<ul style="list-style-type: none"> • Being able to align learning targets, instructions, and outcomes. • Being able to measure and evaluate student learning in a variety of dimensions. • Being able to use outcome data to guide and change instruction. • Monitoring and assessing students' understanding of content through a variety of means, providing feedback to students to assist learning and adjusting instructional strategies.
<p>2.5 Environment for Learning - Biology teachers know safe and supportive learning environments reflecting high expectations for the success of all students. Learning environments refers to:</p> <ul style="list-style-type: none"> • Know examples of changes that can make physical spaces more effective for learning science. • Know typical examples of psychological and social environments of the student engaged in learning science. • Know safety in all areas related to science instruction.
<p>2.5.1 Biology teachers design and manage the instructional environment::</p> <ul style="list-style-type: none"> • Able to design/manage physical spaces to enhance learning of science. • Able to create a climate that promotes fairness. • Able to establish and maintain rapport with students. • Able to communicate clear, challenging expectations to each student. • Able to establish and maintain consistent standards of classroom behavior. • Able to use instructional time effectively. • Able to demonstrate safe treatment and ethical use of living organisms. • Able to create a safe environment conducive to learning.
<p>3.0 Common Core – Professional Practice:</p>
<p>3.1 Biology teachers have a knowledge base that prepares them for professional practice. Professional practice refers to:</p> <ul style="list-style-type: none"> • Knowledge of science and educational professional organizations. • Knowledge of standards of ethical behavior consistent with the best interests of students and the community.
<p>3.2 Biology teachers participate in the professional community, improving practice through their personal actions, education, and development. Professional practice refers to teachers being able to:</p> <ul style="list-style-type: none"> • Participate in the activities of the professional community to include colleagues, organizations, and other agencies, to improve student learning. • Demonstrate ethical behavior consistent with the best interests of students and the community, as stated in Washington's Code of Professional Conduct, and local, state, and federal laws and regulations. • Reflect on professional practices and continuous efforts to ensure the highest quality of science instruction. • Willingly work with students and new colleagues as they enter the profession. • Communicate effectively with parents/guardians, business and industry, and other agencies, and the community at large to support learning by all students.