Field 045: Science—Life Science
REPA Educator Standards

Standard 1: The Nature and Processes of Science
Life science teachers have a broad and comprehensive understanding of the nature of science and the processes of scientific inquiry, including:

1.1 the characteristics, assumptions, and goals of science

1.2 the tentative nature of scientific knowledge, which is subject to change as new evidence, new tools, or new ways of thinking become available

1.3 the formulation of testable hypotheses and the principles and procedures for designing and conducting scientific investigations

1.4 common tools, materials, and technology used in life science investigations

1.5 the collection, organization, analysis, interpretation, and communication of scientific data, including the use of technology

1.6 the safe execution of laboratory exercises and safe storage and disposal of chemicals and other materials

1.7 the role and applications of mathematics in science

1.8 the characteristics and uses of various sources of scientific information and the evaluation of scientific information, claims, and arguments

1.9 the role of peer review and critical evaluation of the results of scientific investigations, models, and explanations

Standard 2: Central Concepts and Connections in Science
Life science teachers have a comprehensive understanding of the core ideas in other science disciplines and of the relationships between science, engineering, technology, and society, including:

2.1 the unifying concepts and processes that cut across the sciences and engineering

2.2 the basic concepts and major principles of physical science

2.3 the basic concepts and major principles of Earth and space science

2.4 the basic characteristics, principles, and goals of the engineering, or technological, design process

2.5 the interconnections between the various disciplines of science

2.6 the interrelationships between science and technology

2.7 the social, cultural, and ethical aspects of science and technology

2.8 the historical development of important ideas in science from different periods and cultures

Standard 3: Cellular Chemistry and Structure

Life science teachers have a broad and comprehensive understanding of cellular chemistry, structures, and functions, including:

3.1 the properties of biologically important elements, ions, and compounds, such as carbon and water, and their roles in living systems

3.2 the structures, properties, and functions of carbohydrates, lipids, proteins, and nucleic acids and the processes involved in their synthesis and breakdown

3.3 the properties of enzymes and enzyme-mediated reactions

3.4 the structures and functions of membranes, organelles, and other cellular and extracellular components

3.5 the inputs and products, biochemical pathways, and cellular structures and components involved in photosynthesis and cellular respiration

3.6 the characteristics and functions of cells from various types of organisms and specialized cells within multicellular organisms

3.7 basic physiological functions and homeostatic mechanisms of cells

Standard 4: Organisms

Life science teachers have a broad and comprehensive understanding of the organization and structures of organisms and the processes involved in growth, maintenance, and reproduction, including:

4.1 the hierarchical levels of organization in multicellular organisms

4.2 the characteristics of stem cells and the process of cellular differentiation

4.3 the structure, organization, function, and roles of different types of tissues in organisms

4.4 the functions and interrelationships of organs in organ systems

4.5 the structures, physiological processes, and behaviors of various organisms for carrying out essential life functions, including obtaining and using matter and energy

4.6 the structures, processes, and strategies used by organisms to maintain homeostasis

4.7 reproductive strategies, developmental characteristics, and life cycles of organisms from different taxonomic groups

4.8 basic anatomy and physiology of the primary components of human body systems

Standard 5: Interdependence

Life science teachers have a broad and comprehensive understanding of ecological principles, the interactions between living and nonliving components of ecosystems, and the relationships between organisms, including:

5.1 abiotic and biotic factors and their effects on organisms in an ecosystem

5.2 characteristics of populations and factors that affect population growth and size

5.3 the types of relationships and interactions between organisms in an ecosystem

5.4 the flow of energy and the cycling of matter through ecosystems

5.5 the characteristics of food webs; the roles of producers, consumers, and decomposers; and the interdependence of organisms within a food web

5.6 factors that affect the stability of an ecosystem

5.7 changes in ecosystems over time

5.8 the impact of human activities and natural phenomena on ecosystems and the effects of such changes on biodiversity

Standard 6: Heredity and Genetics

Life science teachers have a broad and comprehensive understanding of the molecular basis of heredity, the processes of cell division, and the principles of genetics, including:

6.1 the structure of DNA and RNA and the processes of replication, transcription, translation, and protein synthesis

6.2 the characteristics and functions of genes, mechanisms of gene regulation, and the control of gene expression

6.3 the relationships among DNA, chromosomes, and genes

6.4 types of mutations and chromosomal abnormalities and their common causes and effects

6.5 the processes and outcomes of mitosis, meiosis, and binary fission

6.6 the behavior of chromosomes during cell division and the relationship to hereditary patterns

6.7 sources of genetic variation in populations

6.8 the principles of genetics, patterns of inheritance, and their application to genetics problems

6.9 the basic principles, methods, and applications of genetic engineering

Standard 7: Evolution

Life science teachers have a broad and comprehensive understanding of evolution, the history of life on Earth, and modern taxonomic classification, including:

7.1 modern evolutionary theory and its historical development and supporting evidence

7.2 the process of natural selection, conditions necessary for natural selection to occur, and factors that affect natural selection and the development of adaptations in a population

7.3 the use of evolutionary theory in explaining the unity and diversity of life

7.4 scientific theories of the origins and history of life on Earth and supporting evidence

7.5 the use of biochemical, fossil, anatomical, developmental, and genetic evidence to establish evolutionary relationships between organisms

7.6 similarities and differences in organisms from various taxonomic groups

7.7 modern methods and systems of taxonomic classification

Standard 8: Science Instruction and Assessment

Life science teachers have a broad and comprehensive understanding of content-specific instruction and assessment in science, including:

8.1 the Indiana Revised Academic Standards for Science

8.2 the National Science Education Standards, the NCATE/NSTA Standards for Science Teacher Preparation, the Common Core State Standards for Literacy: Science and Technical Subjects, and the ISTE National Educational Technology Standards

8.3 instructional strategies and resources for promoting students' development of conceptual understanding, inquiry skills, and scientific habits of mind

8.4 strategies and skills for planning and designing science instruction, including the use of techniques and approaches that meet the needs of diverse learners

8.5 instructional strategies and communication methods that encourage active inquiry, supportive interaction, and collaboration in the science classroom

8.6 strategies and resources for promoting students' reading, writing, and mathematics skills in science

8.7 strategies and skills for selecting, adapting, and using technological resources to enhance teaching and learning in science

8.8 procedures, resources, and guidelines for maintaining a safe science learning environment and ensuring the humane and ethical treatment of living organisms

8.9 strategies and skills for effectively assessing student understanding and mastery of essential science concepts and skills