



Biology 2 - Zoology & Botany CURRICULUM

Board Approved: November 2024

Course Information

Course Description:

ZoBot offers a comprehensive exploration of two fundamental branches of biology – animals and plants. Through hands-on activities, interactive labs, and student-led investigation, students will develop a deep understanding of the diversity, interconnectedness, and significance of life on Earth.

Transfer Goals:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Use critical thinking, science, and engineering practices to analyze ideas and phenomena to solve problems.
- Recognize that science is an ongoing human endeavor that helps us understand our universe.

Curriculum Standards: [Science Missouri Learning Standards](#)

Curriculum Resource(s): TBD

**priority standards indicated in bold*

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Unit 1: Introduction to Animals

Timeframe: 2 weeks

Unit Description: This unit will introduce the basic skills and concepts required to be successful in ZoBot. Students will investigate animal characteristics, evolutionary relationships, and basic body structure.

Enduring Understandings:

- Animals are a unified group based on specific criteria.
- Animals are classified based on their characteristics and evolutionary relationships.
- Animals show organization in their body plans, and these levels of organization support essential life functions.

Essential Questions:

- What are the key features of animals?
- How does animal form and function impact their ecological role?
- What evolutionary adaptations are present in animals?

Unit 1 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
<p>Priority Standard 3 MLS: 9-12.LS1.A.2 9-12.LS4.A.1 9-12.LS2.B.2</p>	<ul style="list-style-type: none"> • I can describe the six major characteristics of animals: eukaryotic, multicellular, motile, heterotrophic, lack a cell wall, and have a blastula stage of development.
<p>Priority Standard 2 MLS: 9-12.LS4.A</p>	<ul style="list-style-type: none"> • I can create/interpret a cladogram to evaluate evolutionary relationships. • I can understand how the nine animal phyla in this course relate to one another from an evolutionary perspective. • I can group the nine phyla into the following evolutionary groups: basal phyla, lophotrochozoa, ecdysozoa, and deuterostomia. • I can describe the basic characteristics of each evolutionary group. • I can describe the taxonomic organization structure utilized to describe members of Animalia.
<p>Priority Standard 1 MLS: 9-12.LS1.A.2</p>	<ul style="list-style-type: none"> • I can identify the relationships between cells, tissues, organs, and organ systems. • I can describe the components of the basic animal body plan: tissue organization, body cavity, and embryological development.

**priority standards indicated in bold*

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Unit 2: Porifera and Cnidaria

Timeframe: 3 weeks

Unit Description: This unit explores the key structures and functions of organisms belonging to the phyla Porifera and Cnidaria and how these structures and functions allow them to fulfill their ecological role. Students will also examine the key evolutionary adaptations that are found in these phyla.

Enduring Understandings:

- Sponges are some of the simplest animals and some of the first to evolve key features of animals.
- Cnidarians have alternating body plans that demonstrate different versions of a life cycle.
- The symmetry of an organism impacts its function and lifestyle.

Essential Questions:

- How do animals of Porifera and Cnidaria demonstrate key features of animals?
- How does the form and function of Porifera and Cnidaria impact their ecological role?
- What evolutionary adaptations are present in Porifera and Cnidaria?

Unit 2 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
Priority Standard 1 MLS: 9-12.LS1.A.2	<ul style="list-style-type: none"> • I can develop an accurate model of a representative organism of the phylum Porifera that identifies the structure and function of choanocytes, amoebocytes, pinacocytes, ostia, and osculum. • I can identify parts of the model that are adaptations specific to survival in that organism's environment. • I can explain how adaptations in the model help the organism survive. • I can connect phyla-specific vocabulary and concepts to broader biological concepts.
Priority Standard 2 MLS: 9-12.LS4.A	<ul style="list-style-type: none"> • I can explain how members of Porifera fit into the evolutionary timeline of animals (multicellularity). • I can explain how members of Cnidaria fit into the evolutionary timeline of animals (tissues, radial symmetry). • I can predict/explain the development of new adaptations based on an organism's environment.
Priority Standard 3 MLS: 9-12.LS1.A.2	<ul style="list-style-type: none"> • I can utilize the definition of animals to support an argument that organisms from Porifera and Cnidaria should be defined as one. • I can support a scientific claim with evidence and reasoning.

**priority standards indicated in bold*

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9-12.LS4.A.1 9-12.LS2.B.2	
Priority Standard 4 MLS: 9-12.LS1.A.3	<ul style="list-style-type: none"> ● I can generate a testable question OR identify a testable question in a research scenario related to Cnidaria feeding response (Hydra-Daphnia lab). ● I can design an experiment to generate data that describes a feedback mechanism. ● I can describe how the tissues and systems of a specific organism help maintain homeostasis in that organism (cnidocyte, cnidocil, nematocyst, epitheliomuscular cells, mouth, anus, extracellular digestion).

**priority standards indicated in bold*

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Unit 3: Platyhelminthes and Nematoda

Timeframe: 3 weeks

Unit Description: This unit explores the key structures and functions of organisms belonging to the phyla Platyhelminthes and Nematoda and how these structures and functions allow them to fulfill their ecological roles. Students will also examine the key evolutionary adaptations found in these phyla.

Enduring Understandings:

- Bilateral symmetry is a key evolutionary advance that influences function and subsequent evolutionary steps.
- Nematodes play many key roles in ecosystems that may go unnoticed.

Essential Questions:

- How do animals of Platyhelminthes and Nematoda demonstrate key features of animals?
- How do the form and function of Platyhelminthes and Nematoda impact their ecological role?
- What evolutionary adaptations are present in Platyhelminthes and Nematoda?

Unit 3 Standards	
STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
<p>Priority Standard 1</p> <p>MLS: 9-12.LS1.A.2</p>	<ul style="list-style-type: none"> • I can develop an accurate model of a representative organism of the phylum Platyhelminthes that identifies how the nerve net, neurons, ganglion, and ocelli allow the organism to respond to light. • I can identify parts of the model that are adaptations specific to survival in that organism's environment. • I can explain how adaptations in the model help the organism survive. • I can connect phyla-specific vocabulary and concepts to broader biological concepts.
<p>Priority Standard 2</p> <p>MLS: 9-12.LS4.A</p>	<ul style="list-style-type: none"> • I can explain how members of Platyhelminthes fit into the evolutionary timeline of animals (cephalization, bilateral symmetry, mesoderm). • I can explain how members of Nematoda fit into the evolutionary timeline of animals (pseudocoelom complete digestive system). • I can predict/explain the development of new adaptations based on the environment that an organism is in.
<p>Priority Standard 3</p> <p>MLS:</p>	<ul style="list-style-type: none"> • I can utilize the definition of animals to support an argument that organisms from Platyhelminthes and Nematoda should be defined as one.

**priority standards indicated in bold*

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<p>9-12.LS1.A.2 9-12.LS4.A.1 9-12.LS2.B.2</p>	<ul style="list-style-type: none"> ● I can support a scientific claim with evidence and reasoning. ● I can describe the taxonomy of Platyhelminthes using the following terms: Turbellaria, Monogenea, Trematoda, and Cestoidia.
<p>Priority Standard 4</p> <p>MLS: 9-12.LS1.A.3</p>	<ul style="list-style-type: none"> ● I can generate a testable question OR identify a testable question in a research scenario related to Platyhelminthes' light response (Planaria light lab). ● I can design an experiment to generate data that describes a feedback mechanism. ● I can describe how the tissues and systems of a specific organism help maintain homeostasis in that organism.

**priority standards indicated in bold*

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Unit 4: Mollusca and Annelida

Timeframe: 4 weeks

Unit Description: This unit explores the key structures and functions of organisms belonging to the phyla Mollusca and Annelida and how these structures and functions allow them to fulfill their ecological roles. Students will also examine the key evolutionary adaptations found in these phyla.

Enduring Understandings:

- Mollusks are united as a group due to similar structures and variations of the same body plan.
- Segmentation in annelids is an evolutionary advance that influences the anatomy and function of annelids and subsequent phyla in evolutionary time.

Essential Questions:

- How do animals of Mollusca and Annelida demonstrate key features of animals?
- How do the form and function of Mollusca and Annelida impact their ecological role?
- What evolutionary adaptations are present in Mollusca and Annelida?

Unit 4 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
Priority Standard 1 MLS: 9-12.LS1.A.2	<ul style="list-style-type: none"> • I can develop an accurate model to demonstrate how organisms in the phylum Mollusca organize the head, foot, visceral mass, and shell into a variety of body plans that are each adapted to their ecological role. • I can identify parts of the model that are adaptations specific to survival in that organism's environment. • I can explain how adaptations in the model help the organism survive. • I can connect phyla-specific vocabulary and concepts to broader biological concepts.
Priority Standard 2 MLS: 9-12.LS4.A	<ul style="list-style-type: none"> • I can explain how members of Mollusca fit into the evolutionary timeline of animals. • I can explain how members of Annelida fit into the evolutionary timeline of animals (metamerism, tagmatization). • I can predict/explain the development of new adaptations based on the environment that an organism is in.
Priority Standard 3 MLS: 9-12.LS1.A.2	<ul style="list-style-type: none"> • I can utilize the definition of animals to support an argument that organisms from Mollusca and Annelida should be defined as one. • I can support a scientific claim with evidence and reasoning. • I can describe the taxonomy of Mollusca using the following terms: Gastropoda, Cephalopoda, and Bivalvia.

**priority standards indicated in bold*

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9-12.LS4.A.1 9-12.LS2.B.2	
Priority Standard 4 MLS: 9-12.LS1.A.3	<ul style="list-style-type: none"> ● I can generate a testable question OR identify a testable question in a research scenario related to Annelid response to external stimuli (student choice lab). ● I can design an experiment to generate data that describes a feedback mechanism. ● I can describe how the tissues and systems of a specific organism help maintain homeostasis in that organism.

**priority standards indicated in bold*

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Unit 5: Arthropoda and Echinodermata

Timeframe: 3 weeks

Unit Description: This unit explores the key structures and functions of organisms belonging to the phyla Arthropoda and Echinodermata and how these structures and functions allow them to fulfill their ecological roles. Students will also examine the key evolutionary adaptations found in these phyla.

Enduring Understandings:

- Structures found in arthropods enabled their transition as terrestrial organisms.
- Arthropods demonstrate extreme biodiversity.
- Echinoderms demonstrate evolutionary adaptations despite being less complex than previous phyla.

Essential Questions:

- How do animals of Arthropoda and Echinodermata demonstrate key features of animals?
- How do the form and function of Arthropoda and Echinodermata impact their ecological role?
- What evolutionary adaptations are present in Arthropoda and Echinodermata?

Unit 5 Standards	
STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
<p>Priority Standard 1</p> <p>MLS: 9-12.LS1.A.2</p>	<ul style="list-style-type: none"> • I can develop an accurate model to demonstrate how gas exchange systems, exoskeletons, and jointed appendages allowed members of Arthropoda to survive on land. • I can identify parts of the model that are adaptations specific to survival in that organism’s environment. • I can explain how adaptations in the model help the organism survive. • I can connect phyla-specific vocabulary and concepts to broader biological concepts.
<p>Priority Standard 2</p> <p>MLS: 9-12.LS4.A</p>	<ul style="list-style-type: none"> • I can explain how members of Echinodermata fit into the evolutionary timeline of animals (bilateral to radial symmetry). • I can predict/explain the development of new adaptations based on the environment that an organism is in.
<p>Priority Standard 3</p> <p>MLS: 9-12.LS1.A.2 9-12.LS4.A.1</p>	<ul style="list-style-type: none"> • I can utilize the definition of animals to support an argument that organisms from Arthropoda and Echinodermata should be defined as one. • I can support a scientific claim with evidence and reasoning. • I can describe the taxonomy of Arthropoda using the following terms: Crustacea, Hexapoda, Chelicerata, and Myriapoda.

**priority standards indicated in bold*

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Unit 6: Chordates

Timeframe: 6 weeks

Unit Description: This unit explores the key structures and functions of organisms belonging to the phylum Chordata and how these structures and functions allow them to fulfill their ecological role. Students will also examine the key evolutionary adaptations found in these phyla.

Enduring Understandings:

- Compare the subphylum of chordates regarding their basic structure and defining characteristics.
- Analyze the anatomy and physiology of a chordate and relate it to the organism's classification and ecological niche.
- Relate adaptations of organisms to the survival of organisms in various ecosystems.

Essential Questions:

- What determines the classification of different chordates?
- How do the modified body plans of different chordate classes allow them to survive in their specific ecosystem?

Unit 6 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
<p>Priority Standard 1</p> <p>MLS: 9-12.LS1.A.2</p>	<ul style="list-style-type: none"> • I can develop an accurate model that compares the structure and function of the notochord, post-anal tail, dorsal hollow nerve cord, and pharyngeal slits in an example organism from two of the chordate classes. • I can identify parts of the model that are adaptations specific to survival in that organism's environment. • I can explain how adaptations in the model help the organism survive. • I can connect phyla-specific vocabulary and concepts to broader biological concepts.
<p>Priority Standard 2</p> <p>MLS: 9-12.LS4.A</p>	<ul style="list-style-type: none"> • I can explain how members of Chordata fit into the evolutionary timeline of animals (nerve chord, pharyngeal slits, notochord, post-anal tail). • I can predict/explain the development of new adaptations based on the environment that an organism is in.
<p>Priority Standard 3</p> <p>MLS: 9-12.LS1.A.2 9-12.LS4.A.1 9-12.LS2.B.2</p>	<ul style="list-style-type: none"> • I can utilize the definition of animals to support an argument that organisms from Chordata should be defined as one. • I can support a scientific claim with evidence and reasoning. • I can describe the taxonomy of Chordata using the following terms: Urochordata, Cephalochordata, Craniata, Petromyzontida, Chondrichthyes, Actinopterygii, Sarcopterygii, Amphibia, Reptilia, Aves, Mammalia.

**priority standards indicated in bold*

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Unit 7: Introduction to Plants

Timeframe: 1.5- 2 weeks

Unit Description: Explores the key characteristics of plants and different basic categorizations of types of plants. Students will also learn anatomical and physiological terms for describing plants and apply these terms to new plant specimens.

Enduring Understandings:

- Plants are a diverse group of organisms unified by their eukaryotic, photosynthetic, multicellular nature and the presence of the molecule cellulose.
- Plants are separated into groups based on their internal tissue types and reproduction methods.
- Botanical terms describe the anatomy and basic physiology of many types of plants.

Essential Questions:

- What are the key features of plants?
- How do the classification systems used for different groups of plants compare and contrast?
- What key terms must be understood to discuss parts of a plant's anatomy and its function?

Unit 7 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
Cross-Cutting Concepts (CCC) Structure and Function	<ul style="list-style-type: none"> ● I can define and identify an organism as a plant using evidence. ● I can compare plants to other groups of organisms that are similar to plants (algae and lichen). ● I can describe key plant structures (eukaryotic cells, photosynthetic cells, cellulose) and how they contribute to the plant's overall function.
SEP 9-12 7E	<ul style="list-style-type: none"> ● I can categorize a plant based on its structures and internal characteristics. ● I can use naming patterns and rules to identify appropriate names for plant specimens.
9-12 LS1.A1	<ul style="list-style-type: none"> ● I can use botanical terms to describe different levels of organization of tissues and organs found in plants. ● I can observe a botanical sample and use correct botanical terms to describe the leaves, flowers, roots, and other key structures of plants. ● I can model botanical terms to demonstrate their locations and functions. ● I can explain how plant structures carry out the essential functions of living things.

**priority standards indicated in bold*

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Unit 8: Reproduction and Classification of Flowering Plants

Timeframe: 3 weeks

Unit Description: This unit covers names and descriptions of key flower structures and provides skills in identifying characteristics of different types of fruits. Students then use these skills to identify local plants and create guides and keys to identify plants they encounter in their ecoregion.

Enduring Understandings:

- Flowers share common structures that perform key functions in plant reproduction.
- Fruits are classified based on their structures and how the seeds are contained. All fruits are important for reproduction and seed dispersal.
- Field Guides and Dichotomous Keys use observable features of plants to identify groups and species.

Essential Questions:

- What are the structures and functions of a flower?
- What is the botanical definition of a fruit? What characteristics determine if an object is classified as a fruit?
- How can a dichotomous key be applied to classify a group of plants, and what steps are involved in its development?

Unit 8 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
6-8 LS1.B1	<ul style="list-style-type: none"> • I can identify and describe the function of flower parts and how they relate to the reproduction of flowering plants. • I can describe the basic steps of a flowering plant life cycle. • I can understand the role of pollinators in shaping flower anatomy. • I can describe how fruits are classified botanically. • I can explain the roles of pollinators in plant reproduction.
SEP 6-8 2E	<ul style="list-style-type: none"> • I can model a plant using flower and fruit terms. • I can use modeling to accentuate important plant identification characteristics.
CCC Patterns	<ul style="list-style-type: none"> • I can organize a plant specimen collection using relevant scientific patterns and criteria. • I can develop a dichotomous key to identify local plants.

**priority standards indicated in bold*

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Unit 9: Plant Ecosystems and Plant Evolution

Timeframe: 2.5 weeks

Unit Description: Plants are parts of ecosystems, and different ecosystems have different biotic and abiotic characteristics. Plants have co-evolved with many different organisms in their environments and can interact with their ecosystems in many different ways.

Enduring Understandings:

- Ecosystems have different abiotic and biotic factors. We live in a specific ecoregion with its own abiotic and biotic factors that impact the biodiversity in our region.
- Plants have coevolved with many other organisms in their ecosystems via mutualism, parasitism, and herbivory relationships.
- Plants play many different roles in their ecosystems.

Essential Questions:

- What are the key features of an ecosystem?
- How does the process of coevolution shape the interactions between plants and other organisms? What are some specific examples of how plants have coevolved within an ecosystem?
- In what ways do plants interact with the abiotic factors in their ecosystem?

Unit 9 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
6-8 LS4.B1 (Crosswalk)	<ul style="list-style-type: none"> ● I can identify plant phenotypes (plant characteristics) adapted to specific environmental conditions. ● I can provide evidence to support a claim about adaptations found in specimens of local plants.
9-12 LS2.B2	<ul style="list-style-type: none"> ● I can list and describe soil microorganisms. ● I can explain how soil microorganisms and plants contribute to the cycling of nutrients in the ecosystem.
9-12: LS2.C1	<ul style="list-style-type: none"> ● I can collect and evaluate ecosystem data to compare two ecosystems. ● I can define mutualism and describe how flowers and pollinators demonstrate this concept. ● I can identify connections between biotic (living) and abiotic (non-living) things. ● I can describe different methods of plant defense against herbivory and the process by which these defenses may have evolved.

**priority standards indicated in bold*

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Unit 10: Plants in Society: Past and Present

Timeframe: 3 weeks

Unit Description: Students will investigate many different topics related to plants, their past uses, and the challenges they face in the present. These topics include invasive species, ethnobotany, phytochemicals, and plant conservation.

Enduring Understandings:

- Plants are important for human culture and advancement.
- Invasive species are impacting biodiversity and ecosystems.
- Climate changes can negatively impact plant species and how they function in ecosystems and society.

Essential Questions:

- How have plants been used in different cultures and contexts?
- How are plants used in our society today?
- What are the potential risks to the health of plant populations in our ecoregion and around the world?

Unit 10 Standards

STANDARD CODE	STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:
9-12 LS2.A	<ul style="list-style-type: none"> ● I can sample a population of plant species and use a mathematical model to describe the population. ● I can identify ways that invasive plants can disrupt the balance of an ecosystem and cause economic damage.
9-12 LS2.C2	<ul style="list-style-type: none"> ● I can describe the potential impacts of climate change on plants. ● I can explain the importance of plants for different societies and cultures by using specific examples. ● I can examine the connections between plant biodiversity and the potential future of discoveries in plant medicine. ● I can design a solution to help reduce the adverse effects of human impact on a specific local plant species.

**priority standards indicated in bold*

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