

Teaching &
Learning
Standards

ZOOLOGY

Science

TROUT UNLIMITED
CONUTTA CHAPTER PRESENTS
TROUT IN THE CLASSROOM
CHEROKEE HIGH

Cherokee
County
School
District

Course Description

The Zoology Cherokee Teaching & Learning Standards are designed to teach students to recognize key features of the major body plans that have evolved in animals and how those body plans have changed over time resulting in the diversity of animals that are evident today. In addition to classification and recognition, students will learn about the anatomical and physiological characteristics of animals. These characteristics relate to how an animal functions and can help students see the connections uniting animal groups. An understanding of form and function allows students to study how animals have evolved over time and to relate animals to their role in an ecosystem. Finally, students will develop an understanding that all living things are interconnected and that the worldwide activities of humans can contribute to animal diversity both positively and negatively. Students will learn how humans are dependent on animal species for advances in medicine, ecosystem maintenance, and food supply.

Science standards integrate the three dimensions of **Science and Engineering Practices (SEPs)**, **Crosscutting Concepts (CCCs)**, and **Disciplinary Core Ideas (DCIs)** to provide a comprehensive framework that emphasizes active engagement, interdisciplinary connections, and core scientific principles. Together, they show how science standards engage *students* in obtaining, evaluating, and communicating information.

Science and Engineering Practices	Crosscutting Concepts	Disciplinary Core Ideas
Asking Questions (Science) and Defining Problems (Engineering)	Patterns	Engineering, Technology, and the Application of Science (TLS)
Developing and Using Models	Cause and Effect: Mechanism and Explanation	
Planning and Carrying Out Investigations	Scale, Proportion, and Quantity	Physical Science (P)
Analyzing and Interpreting Data	Systems and System Models	
Mathematics and Computational Thinking	Energy and Matter: Flows, Cycles, and Conservation	Life Science (L) Zoology (Z)
Constructing Explanations (Science) and Designing Solutions (Engineering)		
Engaging in Argument from Evidence	Structure and Function	Earth and Space Science (E)
Obtaining, Evaluating, and Communicating Information	Stability and Change	

Science and Engineering Practices are fundamental approaches that scientists and engineers use to investigate the natural world and solve practical problems. **Crosscutting Concepts** in science are overarching themes that bridge various disciplines, helping students and researchers see connections and deepen their understanding of the natural world. **Disciplinary Core Ideas** are fundamental concepts that students need to understand to develop a deep knowledge of science across various disciplines.

Thinking Like a Scientist

Thinking Like a Scientist standards represent scientific thinking skills that should be incorporated throughout the entire course.

Overarching Standard

TLS9-12: Refine scientific inquiry and problem-solving skills by designing and conducting investigations, applying scientific theories, and critically evaluating scientific literature.

Supporting Standards for Student Mastery

TLS9-12.a: Use specialized scientific terms and concepts to analyze and explain scientific phenomena.

TLS9-12.b: Design and conduct independent experiments with multiple variables.

TLS9-12.c: Engage in complex data collection using advanced tools and technology (e.g., sensors, probes, software, simulations). Apply statistical methods to interpret data and generate a variety of graph types.

TLS9-12.d: Critically evaluate and communicate complex findings through reports and presentations. Contribute to scientific discussions by constructing and defending scientific explanations. Use and critique evidence to strengthen scientific arguments and discussions.

Semester 1 (August – December)

Unit 1: Biodiversity & Phylogeny of Animals (2-3 weeks)

In this introductory unit, students will explore the diversity of animal life and the evolutionary history that has shaped it. They will investigate how different species have adapted to environmental changes and use evidence from morphology, embryology, and biochemistry to construct explanations of the relationships among animal taxa. They will develop models like cladograms and phylogenetic trees to place these taxa in an evolutionary context, supporting hypotheses about their relationships. Additionally, students will examine the geological history of Earth to understand how major environmental changes have influenced animal evolution. Through these investigations, students will understand how evolutionary processes drive the diversity and adaptation of animal species.

Overarching Standard for Unit 1

Z2: Obtain, evaluate, and communicate information to explain the evolutionary history of animals over the geological history of Earth.

Z2.b: Construct an explanation of how evolution allows species to adapt to environmental changes.
(Clarification statement: Explanations should address the mechanisms that drive evolution like adaptation, natural selection, convergence, and speciation.)

Supporting Standards for Student Mastery in Unit 1

- Z1.a:** Construct an explanation of the relationships among animal taxa using evidence from morphology, embryology, and biochemistry.
- Z1.c:** Develop a model (i.e. cladogram, phylogenetic tree) using data to place taxa in a phylogenetic (evolutionary) context to support hypotheses of relationships.
- Z2.a:** Construct an explanation of the geological history of earth and the effects of major environmental changes.
(Clarification statement: Explanations should be based on evidence from the fossil and geologic record. Major events include Cambrian Explosion and the causes of mass extinction events.)
- Z3.c:** Construct an explanation based on evidence to relate important structural changes across evolutionary history to key functional transitions.

Unit 2: Porifera & Cnidarians (3-4 weeks)

In this unit, students will investigate two fundamental animal phyla: Porifera (sponges) and Cnidaria (jellyfish, corals, and sea anemones). They will explore the unique characteristics and biological functions of these taxa, focusing on their morphology, life cycles, and ecological roles. Through hands-on investigations, students will analyze patterns in structure and function, such as the differences between sponge and cnidarian body plans, symmetry, and organ systems. They will also develop models to explain various life cycles and symbiotic relationships, such as those between corals and algae. Additionally, students will investigate the impact of human activities on these organisms' biodiversity, including habitat destruction and pollution. This unit aims to provide students with a comprehensive understanding of Porifera and Cnidaria, their evolutionary significance, and their roles in marine ecosystems.

Overarching Standard for Unit 2

Z1: Obtain, evaluate, and communicate information to derive the phylogeny of animal taxa using informative characteristics.

Z1.b: Analyze and interpret data to explain patterns in structure and function and construct a classification of representative animal taxa including: Porifera, Cnidaria, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata, and Chordata.

Supporting Standards for Student Mastery in Unit 2

- Z1.a:** Construct an explanation of the relationships among animal taxa using evidence from morphology, embryology, and biochemistry.
- Z3.a:** Plan and carry out investigations to determine patterns in morphology (including organ systems, symmetry, and body cavities) of representative animal taxa.
- Z4.b:** Develop a model to explain patterns in various life cycles found among animals (e.g., polyp and medusa in cnidarians; multiple hosts and stages in the platyhelminthes or nematode life cycle; arthropod metamorphosis; egg, tadpole, adult stages in the amphibian life cycle).
- Z4.c:** Construct an explanation based on evidence of the effects of symbiotic relationships between animals (i.e., parasites and disease vectors) and between animals and other organisms (i.e., algae in coral; protists in termites; parasites).
- Z5.a:** Ask questions and define problems identifying the cause and effect of human activities on the biodiversity of organisms (including habitat destruction, overharvesting, water consumption, and pollution).

Unit 3: Worms (6 weeks)

In this unit, students will investigate the diverse world of worms, focusing on the major phyla of Platyhelminthes (flatworms), Nematoda (roundworms), and Annelida (segmented worms). They will explore the structural and functional aspects of these taxa and conduct investigations to identify patterns in worm morphology to understand their life functions. Students will also develop models to illustrate various life cycles and analyze the effects of symbiotic relationships. They will evaluate the impacts of human activities and decisions on worm diversity and their ecological roles. This unit aims to provide students with a detailed understanding of worm biology, their evolutionary significance, and their interactions with other organisms and environments.

Overarching Standard for Unit 3

Z3: Obtain, evaluate, and communicate information to compare and contrast structure and function of morphological and genetic characteristics across representative taxa.

Z3.a: Plan and carry out investigations to determine patterns in morphology (including organ systems, symmetry, and body cavities) of representative animal taxa.

Supporting Standards for Student Mastery in Unit 3

Z1.b: Analyze and interpret data to explain patterns in structure and function and construct a classification of representative animal taxa including: Porifera, Cnidaria, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata, and Chordata.

Z3.b: Construct an explanation of life functions (i.e., reproduction, respiration, digestion) at appropriate level of organization for representative taxa.

Z4.b: Develop a model to explain patterns in various life cycles found among animals (e.g., polyp and medusa in cnidarians; multiple hosts and stages in the platyhelminthes or nematode life cycle; arthropod metamorphosis; egg, tadpole, adult stages in the amphibian life cycle).

Z4.c: Construct an explanation based on evidence of the effects of symbiotic relationships between animals (i.e., parasites and disease vectors) and between animals and other organisms (i.e., algae in coral; protists in termites; parasites).

- z5.c:** Construct an argument based on evidence of the short-term and long-term impacts of legal, societal, political, ethical, and economic decisions on animal diversity.
(Clarification statement: Arguments should include, but are not limited to medical, research, and agricultural use of animals.)

Unit 4: Arthropods (6 weeks)

In this unit, students will explore arthropods (insects, arachnids, myriapods, and crustaceans), including their evolutionary history, ecological roles, and adaptations. Students will analyze how evolutionary mechanisms have driven the incredible diversity and adaptability of arthropods. They will also investigate the role of environmental changes in shaping the evolution of arthropods. Through constructing models and explanations, students will relate the structure and function of arthropods to their ecological roles and adaptations. Students will consider the impacts of human activities on arthropod biodiversity. This unit aims to provide a comprehensive understanding of arthropods' evolutionary significance, biological functions, and their interactions with ecosystems.

Overarching Standard for Unit 4

Z2: Obtain, evaluate, and communicate information to explain the evolutionary history of animals over the geological history of Earth.

Z2.b: Construct an explanation of how evolution allows species to adapt to environmental changes.

(Clarification statement: Explanations should address the mechanisms that drive evolution like adaptation, natural selection, convergence, and speciation.)

Supporting Standards for Student Mastery in Unit 4

Z2.a: Construct an explanation of the geological history of earth and the effects of major environmental changes.

(Clarification statement: Explanations should be based on evidence from the fossil and geologic record. Major events include Cambrian Explosion and the causes of mass extinction events.)

Z3.b: Construct an explanation of life functions (i.e., reproduction, respiration, digestion) at appropriate level of organization for representative taxa.

Z4.a: Construct explanations to relate structure and function of animals to ecological roles, including morphological, physiological, and behavioral adaptations.

Z4.b: Develop a model to explain patterns in various life cycles found among animals (e.g., polyp and medusa in cnidarians; multiple hosts and stages in the platyhelminthes or nematode life cycle; arthropod metamorphosis; egg, tadpole, adult stages in the amphibian life cycle).

- z5.a:** Ask questions and define problems identifying the cause and effect of human activities on the biodiversity of organisms (including habitat destruction, overharvesting, water consumption, and pollution).

Semester 2 (January – May)

Unit 5: Mollusks & Echinoderms (5 weeks)

In this unit, students will study mollusks and echinoderms, focusing on their ecological roles, structural adaptations, and interactions with their environments. They will investigate the diverse morphological and physiological characteristics of these animal groups and examine how these structural traits support their survival, reproduction, and ecological functions. Through comparative analysis, students will also explore how mollusks and echinoderms have adapted to their environments and how they interact with other organisms. Additionally, students will assess the impact of human activities on the biodiversity and conservation of these groups. This unit aims to provide students with a comprehensive understanding of mollusks and echinoderms, their roles in ecosystems, and the importance of their conservation.

Overarching Standard for Unit 5

Z4: Obtain, evaluate, and communicate information to assess how animals interact with their environment and one another.

Z4.a: Construct explanations to relate structure and function of animals to ecological roles, including morphological, physiological, and behavioral adaptations.

Supporting Standards for Student Mastery in Unit 5

- Z1.a:** Construct an explanation of the relationships among animal taxa using evidence from morphology, embryology, and biochemistry.
- Z3.a:** Plan and carry out investigations to determine patterns in morphology (including organ systems, symmetry and body cavities) of representative animal taxa.
- Z3.b:** Construct an explanation of life functions (i.e., reproduction, respiration, digestion) at appropriate level of organization for representative taxa.
- Z5.a:** Ask questions and define problems identifying the cause and effect of human activities on the biodiversity of organisms (including habitat destruction, overharvesting, water consumption, and pollution).

Unit 6: Fish & Amphibians (5 weeks)

In this unit, students will dive into the fascinating worlds of fish and amphibians, examining their evolutionary history, physiological adaptations, and ecological roles. They will explore the morphological and functional characteristics of fish as well as the unique adaptations of amphibians. Students will investigate how these features support their survival, reproduction, and interaction with their environments. Additionally, students will develop models to understand the life cycles of fish and amphibians and analyze how these organisms have adapted to different habitats. The unit will also address the impact of human activities on the biodiversity of these groups, including habitat destruction, pollution, and overharvesting. Through this exploration, students will gain insights into the interconnections between human actions and animal conservation, enhancing their understanding of the importance of protecting aquatic and terrestrial ecosystems.

Overarching Standard for Unit 6

Z5: Obtain, evaluate, and communicate information to analyze the relationship between humans and animals within various phyla.

Z5.a: Ask questions and define problems identifying the cause and effect of human activities on the biodiversity of organisms (including habitat destruction, overharvesting, water consumption, and pollution).

Supporting Standards for Student Mastery in Unit 6

Z1.a: Construct an explanation of the relationships among animal taxa using evidence from morphology, embryology, and biochemistry.

Z1.c: Develop a model (i.e. cladogram, phylogenetic tree) using data to place taxa in a phylogenetic (evolutionary) context to support hypotheses of relationships.

Z2.a: Construct an explanation of the geological history of earth and the effects of major environmental changes.
(Clarification statement: Explanations should be based on evidence from the fossil and geologic record. Major events include Cambrian Explosion and the causes of mass extinction events.)

Z3.b: Construct an explanation of life functions (i.e., reproduction, respiration, digestion) at appropriate level of organization for representative taxa.

- Z4.b:** Develop a model to explain patterns in various life cycles found among animals (e.g., polyp and medusa in cnidarians; multiple hosts and stages in the platyhelminthes or nematode life cycle; arthropod metamorphosis; egg, tadpole, adult stages in the amphibian life cycle).
- Z5.c:** Construct an argument based on evidence of the short-term and long-term impacts of legal, societal, political, ethical, and economic decisions on animal diversity.
(Clarification statement: Arguments should include, but are not limited to medical, research, and agricultural use of animals.)

Unit 7: Reptiles & Birds (3 weeks)

In this unit, students will explore the evolutionary history, physiological adaptations, and ecological roles of reptiles and birds. They will examine how these two diverse groups have evolved from common ancestors and adapted to various environmental changes. The unit will cover key adaptations and students will analyze how these adaptations support survival, reproduction, and ecological niches. They will also investigate significant structural and functional changes that have occurred over geological time, linking these changes to evolutionary processes like natural selection and speciation. Additionally, students will design solutions to address conservation challenges and evaluate the impacts of human activities on these groups. This unit aims to deepen students' understanding of the interrelationships between evolution, adaptation, and environmental pressures in reptiles and birds.

Overarching Standard for Unit 7

Z2: Obtain, evaluate, and communicate information to explain the evolutionary history of animals over the geological history of Earth.

Z2.b: Construct an explanation of how evolution allows species to adapt to environmental changes.
(*Clarification statement:* Explanations should address the mechanisms that drive evolution like adaptation, natural selection, convergence, and speciation.)

Supporting Standards for Student Mastery in Unit 7

- Z1.b:** Analyze and interpret data to explain patterns in structure and function and construct a classification of representative animal taxa including: Porifera, Cnidaria, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata, and Chordata.
- Z2.a:** Construct an explanation of the geological history of earth and the effects of major environmental changes.
(*Clarification statement:* Explanations should be based on evidence from the fossil and geologic record. Major events include Cambrian Explosion and the causes of mass extinction events.)
- Z3.b:** Construct an explanation of life functions (i.e., reproduction, respiration, digestion) at appropriate level of organization for representative taxa.

- Z3.c:** Construct an explanation based on evidence to relate important structural changes across evolutionary history to key functional transitions.
- Z4.a:** Construct explanations to relate structure and function of animals to ecological roles, including morphological, physiological, and behavioral adaptations.
- Z5.b:** Design a solution to preserve species diversity in natural and captive environments with regard to conservation, habitat restoration, breeding programs and management of genetic diversity at local and global levels.
- Z5.c:** Construct an argument based on evidence of the short-term and long-term impacts of legal, societal, political, ethical, and economic decisions on animal diversity.
(Clarification statement: Arguments should include, but are not limited to medical, research, and agricultural use of animals.)

Unit 8: Mammals (5 weeks)

In this unit, students will investigate mammals, focusing on their evolutionary history, physiological adaptations, and ecological roles. They will explore key features that define mammals and understand how these traits contribute to their survival and ecological interactions. Students will examine the evolutionary transitions and consider major events in geological history that influenced these changes. They will also analyze various life functions across mammalian species to understand the evolutionary adaptations that support these processes. By developing models of different mammalian life cycles and examining their ecological roles, students will gain insights into how structure and function are related in mammals. Additionally, students will design strategies for conserving mammalian species and preserving biodiversity. They will construct arguments to assess the impacts of human activities and decisions on mammalian diversity. This unit aims to deepen students' understanding of mammals and their critical roles in ecosystems while addressing conservation challenges.

Overarching Standard for Unit 8

- Z5: Obtain, evaluate, and communicate information to analyze the relationship between humans and animals within various phyla.**
- Z5.b:** Design a solution to preserve species diversity in natural and captive environments with regard to conservation, habitat restoration, breeding programs and management of genetic diversity at local and global levels.

Supporting Standards for Student Mastery in Unit 8

- Z2.a:** Construct an explanation of the geological history of earth and the effects of major environmental changes.
(*Clarification statement:* Explanations should be based on evidence from the fossil and geologic record. Major events include Cambrian Explosion and the causes of mass extinction events.)
- Z3.b:** Construct an explanation of life functions (i.e., reproduction, respiration, digestion) at appropriate level of organization for representative taxa.
- Z3.c:** Construct an explanation based on evidence to relate important structural changes across evolutionary history to key functional transitions.

- Z4.a:** Construct explanations to relate structure and function of animals to ecological roles, including morphological, physiological, and behavioral adaptations.
- Z4.b:** Develop a model to explain patterns in various life cycles found among animals (e.g., polyp and medusa in cnidarians; multiple hosts and stages in the platyhelminthes or nematode life cycle; arthropod metamorphosis; egg, tadpole, adult stages in the amphibian life cycle).
- Z5.c:** Construct an argument based on evidence of the short-term and long-term impacts of legal, societal, political, ethical, and economic decisions on animal diversity.
(Clarification statement: Arguments should include, but are not limited to medical, research, and agricultural use of animals.)