7th Grade
Science

Course Description

The Seventh Grade Cherokee Teaching & Learning Standards for Science are designed to give all students an overview of common strands in life science including, but not limited to, diversity of living organisms, structure and function of cells, heredity, ecosystems, and biological evolution. Seventh grade students keep records of their observations, use those records to analyze the data they collect, recognize patterns in the data, use simple charts and graphs to represent the relationships they see, and find more than one way to interpret their findings. They make and use observations to explain the diversity of living organisms and how the organisms are classified, how they reproduce and how genetic information is passed from parents to their offspring. They use different models to represent systems such as cells, tissues, and organs. They use what they know about ecosystems to explain how matter cycles and energy flows through the ecosystem. They use the concepts of natural selection and fossil evidence to construct explanations about the diversity of life that they see. Seventh graders plan and carry out investigations, describe observations, and show information in graphical form. The students replicate investigations and compare results to find similarities and differences.

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)
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.

Semester 1 (August – December)

Unit 0: Thinking Like a Scientist (2 weeks)

In this unit, students in seventh grade will advance their scientific thinking skills through engaging in the scientific method, critical analysis, and collaborative investigations. Students will expand their understanding of scientific terms and concepts, formulate hypotheses based on research questions, utilize tools to conduct investigations, analyze data, and collaborate to interpret experimental results. Thinking Like a Scientist standards should continue to be embedded and developed throughout the course across the entire school year. By the end of the year, students will have developed a deeper understanding of the scientific method, enhanced their critical thinking skills, and strengthened their ability to collaborate effectively in scientific investigations. They will be prepared to apply these skills to more complex scientific challenges and inquiries in subsequent grade levels and beyond.

Overarching Standard for Unit 0

TLS6-8: Advance scientific thinking through the scientific method, critical analysis, and collaborative investigations.

Supporting Standards for Student Mastery in Unit 0

TLS6-8.a: Master and apply scientific vocabulary and concepts.

TLS6-8.b: Develop and test hypotheses using systematic observations and experiments.

TLS6-8.c: Use advanced tools and technology (e.g., sensors, probes, software) for data collection and analysis.

TLS6-8.d: Collaborate to analyze findings and present detailed scientific arguments and reports.

Unit 1: Diversity of Organisms: Characteristics of Life (5 weeks)

In this unit, students will explore the diversity of living organisms and learn how they can be scientifically compared and classified. Students will develop skills in observation, critical thinking, scientific evaluation, and model creation. Students will develop models to categorize organisms based on common characteristics and evaluate historical and modern classification systems.

Overarching Standard for Unit 1

L1: Obtain, evaluate, and communicate information to investigate the diversity of living organisms and how they can be compared scientifically.

L1.a: Develop and defend a model (dichotomous key or organizational chart) that categorizes organisms based on common characteristics.

- Defend how characteristics are used to organize organisms into models.

Supporting Standards for Student Mastery in Unit 1

L1.b: Evaluate historical models of how organisms were classified based on physical characteristics and how that led to the six kingdom system (currently archaea, bacteria, protists, fungi, plants, and animals).

(*Clarification statement*: This includes common examples and characteristics such as, but not limited to:

- Prokaryotic vs. eukaryotic
- Unicellular vs. multicellular
- Asexual vs. sexual reproduction
- Autotroph vs. heterotroph
- Unique cell structures (chloroplasts, flagella, etc.)

Construct an argument of why classification is an ever-changing model. (Modern classification will be addressed in high school.)

Unit 2: Molecules to Organisms: Cell Structures and Processes (6 weeks)

In this unit, students will explore the structures and functions of cells, tissues, organs, and organ systems, focusing on how these components work together to meet the basic needs of organisms. Students will learn foundational knowledge of cell biology and develop skills in model creation, scientific communication, and critical thinking related to cellular structures and functions.

Overarching Standard for Unit 2

L2: Obtain, evaluate, and communicate information to describe how cell structures, cells, tissues, organs, and organ systems interact to maintain the basic needs of organisms.

L2.a: Develop a model and construct an explanation of how cell structures (specifically the nucleus, cytoplasm, cell membrane, cell wall, chloroplasts, lysosome, and mitochondria) contribute to the function of the cell as a system in obtaining nutrients in order to grow, reproduce, make needed materials, and process waste.

(*Clarification statement*: The intent is for students to demonstrate how the component structures of the cell interact and work together to allow the cell as a whole to carry out various processes. Additional structures, beyond those listed, will be addressed in high school Biology. Organelles such as ribosomes, vacuoles, endoplasmic reticulum, etc. may be included in the Advanced course content, but should not be the primary focus.)

(*Clarification statement*: Explain how cells grow and reproduce using the cell cycle (mitosis).)

(*Clarification statement*: Cellular respiration and photosynthesis should be taught at a very conceptual level. For example:

- Location of each process (organelle)
- Purpose of process
- Inputs (reactants) and outputs (products) of each chemical reaction

(*Clarification statement*: The standard does not specifically include osmosis and diffusion. The big idea focuses on how cell structures work together for life functions. Cell transport should be taught at a very basic level as it relates to the cell membrane. The specific types of transport would be more suited for high school biology, but osmosis and diffusion could be included in the Advanced course content.)

Unit 3: Molecules to Organisms: Organization and Body Systems (5 weeks)

In this unit, students will explore the structures and functions of cells, tissues, organs, and organ systems, focusing on how these components work together to meet the basic needs of organisms. Students will learn foundational knowledge of body systems and develop skills in modeling, argumentation, and systems thinking in biological contexts.

Overarching Standard for Unit 3

L2: Obtain, evaluate, and communicate information to describe how cell structures, cells, tissues, organs, and organ systems interact to maintain the basic needs of organisms.

L2.c: Construct an argument that systems of the body (Cardiovascular, Excretory, Digestive, Respiratory, Muscular, Nervous, and Immune) interact with one another to carry out life processes.

(*Clarification statement*: The emphasis is not on learning individual structures and functions associated with each system, but on how systems interact to support life processes.)

Supporting Standards for Student Mastery in Unit 3

L2.b: Develop and use a conceptual model of how cells are organized into tissues, tissues into organs, organs into systems, and systems into organisms.

(*Clarification statement*: Students should understand that tissues and organs are specialized for particular body functions. They do not have to memorize every single body system. Students need a conceptual understanding.)

(*Health standards connection*)

- Discuss the basics of organ donation.
- Define organ donation and give examples of organs that can be donated.

Semester 2 (January – May)

Unit 4: Heredity: Inheritance of Traits (7 weeks)

In this unit, students will investigate how organisms reproduce, either sexually or asexually, and how genetic information is transferred to determine traits in offspring. Students will investigate the roles of genes and chromosomes in inheritance, helping them understand broader concepts in genetic and evolution. They will develop skills in constructing explanations, modeling, and critical analysis of selective breeding practices.

Overarching Standard for Unit 4

L3: Obtain, evaluate, and communicate information to explain how organisms reproduce either sexually or asexually and transfer genetic information to determine the traits of their offspring.

(*Clarification statement*: The focus should not be about memorizing the steps of mitosis/meiosis, but more of a basic understanding of the processes. Students are developing the big idea that organisms reproduce sexually or asexually and learning characteristics of inherited traits. Mitosis and meiosis are intended to be an expectation of high school biology.)

L3.c: Ask questions to gather and synthesize information about the ways humans influence the inheritance of desired traits in organisms through selective breeding.

(*Clarification statement*: The element specifically addresses artificial selection and the ways in which it is fundamentally different from natural selection.)

Supporting Standards for Student Mastery in Unit 4

L3.a: Construct an explanation supported with scientific evidence of the role of DNA, genes, and chromosomes in the process of inheriting a specific trait.

L3.b: Develop and use a model to describe how asexual reproduction can result in offspring with identical genetic information while sexual reproduction results in genetic variation.

(*Clarification statement*: Models could include, but are not limited to, the use of monohybrid Punnett squares to demonstrate the heritability of genes and the resulting genetic variation, identification of heterozygous and homozygous, and comparison of genotype vs. phenotype.)

Unit 5: Biological Evolution: Natural Selection (4 weeks)

In this unit, students will investigate how human activities influence the inheritance of desired traits in organisms through selective breeding and how this process differs from natural forces that shape the diversity and adaptation of living organisms. Students will learn about the theory of evolution, focusing on natural selection, genetic variation, environmental influences, and fossil evidence.

Overarching Standard for Unit 5

L5: Obtain, evaluate, and communicate information from multiple sources to explain the theory of evolution of living organisms through inherited characteristics.

L5.b: Construct an explanation based on evidence that describes how genetic variation and environmental factors influence the probability of survival and reproduction of a species.

- Explain how genetic variations influence adaptations among species.

Supporting Standards for Student Mastery in Unit 5

L3.c: Ask questions to gather and synthesize information about the ways humans influence the inheritance of desired traits in organisms through selective breeding.

(*Clarification statement*: The element specifically addresses artificial selection and the ways in which it is fundamentally different from natural selection.)

L5.a: Use mathematical representations to evaluate explanations of how natural selection leads to changes in specific traits of populations over successive generations.

(*Clarification statement*: Referencing data should be obtained from multiple sources including, but not limited to, existing research and simulations. Students should be able to calculate means, represent this data in a table or graph, and reference it when explaining the principles of natural selection.)

L5.c: Analyze and interpret data for patterns in the fossil record that document the existence, diversity, and extinction of organisms and their relationships to modern organisms.

(*Clarification statement*: Students should interpret data from a cladogram as evidence to show relationships between modern organisms and the fossil record. Evidence of evolution found in comparisons of current/modern organisms such as homologous structures, DNA, and fetal development will be addressed in high school.)

Unit 6: Ecosystems: Interactions, Energy, and Biodiversity (7 weeks)

In this unit, students will construct scientific explanations, develop models, and analyze ecological data from various ecosystems, examining how biotic and abiotic factors interact and influence energy flow and cycling of matter. Students will explore the complex relationships and interdependencies among organisms and between organisms and their environments. They will recognize the impact of resource availability, disease, climate, and human activity on ecosystems, as well as the characteristics of different biomes.

Overarching Standard for Unit 6

L4.: Obtain, evaluate, and communicate information to examine the interdependence of organisms with one another and their environments.

L4.b: Develop a model to describe the cycling of matter and the flow of energy among biotic and abiotic components of an ecosystem. (*Clarification statement*: Emphasis is on tracing movement of matter and flow of energy, not the biochemical mechanisms of photosynthesis and cellular respiration. Knowing the individual steps and exact processes of various biogeochemical cycles is outside of the standard expectation. The focus is movement of matter and energy flow, as shown in a food chain and/or food web. Students should gain an understanding of how organisms and the environment play a role in matter and energy cycling (producers, consumers, etc.). This topic is taught more in depth in high school biology.)

Supporting Standards for Student Mastery in Unit 6

L4.a: Construct an explanation for the patterns of interactions observed in different ecosystems in terms of the relationships among and between organisms and abiotic components of the ecosystem.

(*Clarification statement*: The interactions include, but are not limited to, predator-prey relationships, competition, mutualism, parasitism, and commensalism.)

L4.c: Analyze and interpret data to provide evidence for how resource availability, disease, climate, and human activity affect individual organisms, populations, communities, and ecosystems.

L4.d: Ask questions to gather and synthesize information from multiple sources to differentiate between Earth's major terrestrial biomes (i.e., tropical rain forest, savanna, temperate forest, desert, grassland, taiga, and tundra) and aquatic ecosystems (i.e., freshwater, estuaries, and marine).

(*Clarification statement*: Emphasis is on the factors that influence patterns across biomes such as the climate, availability

of food and water, and location.)