Sixth Grade Science
Units/Core Ideas of Instruction
2022-2023

Curriculum Revision Rationale

For the 2022-23 school year and forward, the science curriculum has been redesigned to reflect current best practice in science. Teachers re-visited the *Framework for K-12 Science Education*, from which the *Next Generation Science Standards (NGSS)* were derived. Per the K-12 framework, "***The overarching goal of our framework for K-12 science education is to ensure that by the end of 12th grade, all students have some appreciation of the beauty and wonder of science; possess sufficient knowledge of science and engineering to engage in public discussions on related issues; are careful consumers of scientific and technological information related to their everyday lives; are able to continue to learn about science outside school; and have the skills to enter careers of their choice, including (but not limited to) careers in science, engineering, and technology***." Within the framework, there are core ideas with essential and supporting questions that guide what students should be learning and doing. The following units/core idea "placemats" are designed around those.

In the pages below, there is a "year at-a-glance" summary page of the units/core ideas with priority and supporting standards, order, and pacing. Following that, are 1-2 page unit/core idea "placemats". Teachers were presented with the core ideas and the essential and supporting questions, and asked to brainstorm possible phenomena. Then, they were presented with the performance expectations that aligned with each core idea, and worked on aligning those components. Finally, the science practices within those performance expectations were identified. Each placemat contains a core idea with essential and supporting questions, sample (not required) anchoring phenomena, priority and supporting standards. Anchoring phenomena are phenomena that are used to design units of instruction. This document explains what makes good anchor phenomena-Qualities of a Good Anchor Phenomenon for a Coherent Sequence of Science Lessons. As teachers use various phenomena to design units over the next year, we hope to add more examples, and possibly example units, for the next school year.

In this newly revised curriculum, there has been a change in priority and supporting standards. Per the front matter of the topic arrangement of the *NGSS*, which is the current arrangement of our *Kentucky Academic Standards,* students are expected to demonstrate proficiency in using the scientific practices, and to use the practices to demonstrate understanding of the core ideas. When re-evaluating the criteria for priority standards, it was determined that the science practices will be given priority, with the performance expectations as supporting. Units of instruction can then be designed with the core ideas, essential & supporting questions, and phenomena in mind. The expectation is that schools are designing units around the core ideas within the same time frame, per the pacing listed within the document.

UNIT 1 **Core Idea:** Forces & Interactions **6 weeks**	**UNIT 2** **Core Idea:** Structures & Properties of Matter **7 weeks**	**Unit 3** **Core Idea:** History of Earth **4 weeks**	**UNIT 4** **Core Idea:** Earth Systems **4 weeks**	**UNIT 5** **Core Idea:** Weather and Climate **4 weeks**	**Unit 6** **Core Idea:** Space Systems **6 weeks**	**Unit 7** **Core Idea:** Matter & Energy in Organisms & Ecosystems **4 weeks**
Prioritized	**Prioritized**	**Prioritized**	**Prioritized**	**Prioritized**	**Prioritized**	**Prioritized**

Standards	Standards	Standards	Standards	Standards	Standards	Standards
-Planning and Carrying Out Investigations **-Constructing Explanations and Designing Solutions** **Supporting:** • 6-PS2-1 • 6-PS2-2	**-Developing and Using Models** **-Obtaining, Evaluating, and Communicating Information** **Supporting:** • 6-PS1-1 • 6-PS1-3 • 6-PS1-4	**-Analyzing and Interpreting Data** **-Constructing Explanations and Designing Solutions** **Supporting:** • 6-ESS2-2 • 6-ESS2-3	**-Constructing Explanations and Designing Solutions** **-Developing and Using Models** **Supporting:** • 6-ESS2-1 • 6-ESS2-4	**-Developing and Using Models** **-Planning and Carrying Out Investigations** **Supporting:** • 6-ESS2-5 • 6-ESS2-6	**-Developing and Using Models** **-Analyzing and Interpreting Data** **Supporting:** • 6-ESS1-1 • 6-ESS1-2 • 6-ESS1-3	**-Developing and Using Models** **-Analyzing and Interpreting Data** **Supporting:** • 6-LS2-1 • 6-LS2-3 • 6-LS2-2

Rationale for Ordering/Bundling of Core Ideas:

Forces and Interactions (6 weeks)
Unit 1 is foundational and builds within Units 3,4,5,6, and 7. It provides a basis for discussion on colliding forces and the effect they have on one another.

Structure and Properties of Matter (7 weeks)
This unit should be included in the discussion of Unit 4,5,6,7, utilizing thermal energy and how particles combine to produce a substance with different properties. Discussions of a match burning is a great connection to the idea that could be used in Unit 4,6,7 in discussion with the wind flow and direction, while keeping the discussion about the particles and energy transfer (also connecting to the 6th grade material on energy transfer)

History of Earth (4 weeks)
This core idea begins the discussion and connection to the culminating core ideas in Matter and Energy in organisms and Ecosystems. This unit can be connected to Unit 4 changes in the earth's systems, space systems and weather and climate. It connects to Unit 7 by allowing students to use the information to explain changes in matter and energy in organisms and the ecosystem in the history of the earth. This also allows you to incorporate unit 1 Energy on the transfer of energy focused on the changing of the earth's crust and possible reasons why.

Earth's Systems (4 weeks)
Earth's systems furthers the discussion of specific changes over time which takes History of Earth and looks at those pieces in a micro/specific way. While using Forces and Interactions to create the discussion and History of Earth for specific instances to show pattern, cause and effect on the earth's crust and ecosystem.

Weather and Climate (4 weeks)

Once there is a strong connection and understanding of the Earth, History, and changes - what those changes were and how space influences the masses (air, water, etc), we then take a deep dive into “what does that look like” and “how does that affect our weather.” Utilizing the previous units, allow us to explain weather and climate bringing back in how did it affect the Earth changes, (and still does) - how has weather affected ecosystems and still does, etc. Energy is the driving force with this unit discussing colliding weather systems, tsunamis and their effects on humans, shorelines, etc.

Space Systems (6 weeks)

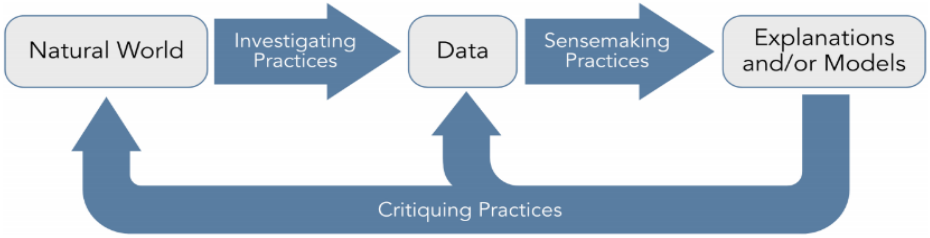
After laying the foundation of Earth and its changes over time, possible reasons for those changes and discussion about energy flow and energy processes, space is a natural progression since it affects the Earth and its processes so directly. The rotation affecting seasons, tides, etc can be incorporated into the discussion. In addition “where we are in the universe” and how the Earth reacts with other planets allows us to have life on Earth. How do the stars affect Earth and life on Earth? What did they play on the History of Earth and how people migrated and found food, etc.

Matter and Energy in organisms and Ecosystems (4 weeks)

The final core idea brings in all the information discussed from the previous 6 units using energy to explain the interaction between organisms, matter and energy in the ecosystems. Utilizing the history of earth, weather patterns and changing climates students can show patterns/cause and effects between these phenomena. Discussion of space and how that supports/does not support life on earth, or has aided to changing life on Earth. (global warming - changing temps, etc)

Science 6 Forces and Interactions (6 weeks)

Unit 1 Core Idea: Forces and Interactions **Essential Question: How can one explain and predict interactions between objects and within systems of objects?**
Supporting Questions: ● How can one describe physical interactions between objects and within systems of objects?



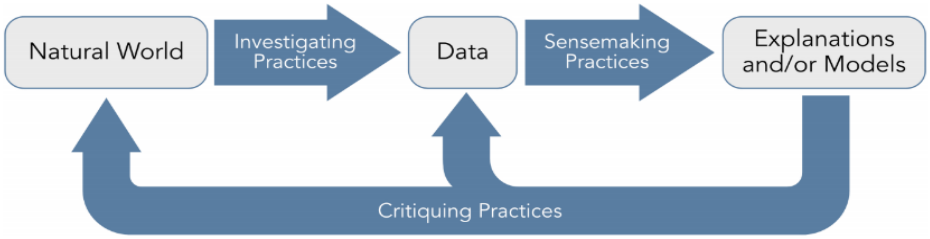
	Investigating Practices	Sensemaking Practices	Critiquing Practices
Science Practices	1. Asking questions	2. Developing and using models	7. Engaging in argument from evidence
	3. Planning and carrying out investigations	4. Analyzing and interpreting data	8. Obtaining, evaluating, and communication information
	5. Using mathematical and computational thinking	6. Constructing explanations	

Priority (Practices):	**Supporting (Performance Expectations):**

Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions. Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (06-PS2-2) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Apply scientific ideas or principles to design an object, tool, process or system. (06-PS2-1)	6-PS2-1 Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.* [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.] 6-PS2-2 Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame, and to change in one variable at a time. Assessment does not include the use of trigonometry.]

Science 6 Structure and Properties of Matter (7 weeks)

Unit 2 Core Idea: Structure and Properties of Matter **Essential Question: How can one explain the structure, properties, and interactions of matter?**
Supporting Questions: ● How can particles combine to produce a substance with different properties? (7th grade) ● How does thermal energy affect particles?



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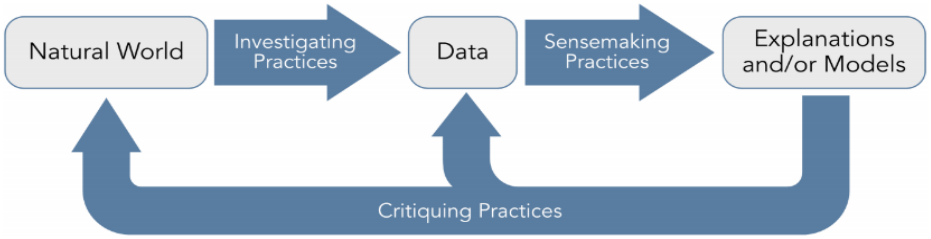
Priority (Practices):	**Supporting (Performance Expectations):**
Developing and Using Models Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to predict and/or describe phenomena. (06-PS1-1),(06-PS1-4) **Obtaining, Evaluating, and Communicating Information** Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods. Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence. (06-PS1-3)	6-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.] 6-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.] 6-PS1-4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gasses to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

Science 6 History of Earth (4 weeks)

Unit 3 Core Idea: History of Earth **Essential Question: How and why is Earth constantly changing?**
Supporting Questions: ● How do people figure out that the Earth and life on Earth have changed over time?

- How does the movement of tectonic plates impact the surface of Earth?



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Priority (Practices):

Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to provide evidence for phenomena. (06-ESS2-3)

Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (06-ESS2-2)

Supporting (Performance Expectations):

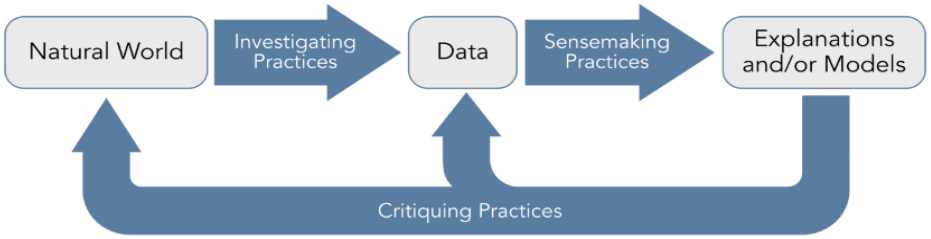
6-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

6-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]

Science 6 — Earth Systems (4 weeks)

Unit 4 Core Idea: Earth Systems
Essential Question: How and why is Earth constantly changing?

Supporting Questions:
- How do the materials in and on Earth's crust change over time?
- How does water influence weather, circulate in the oceans, and shape Earth's surface?



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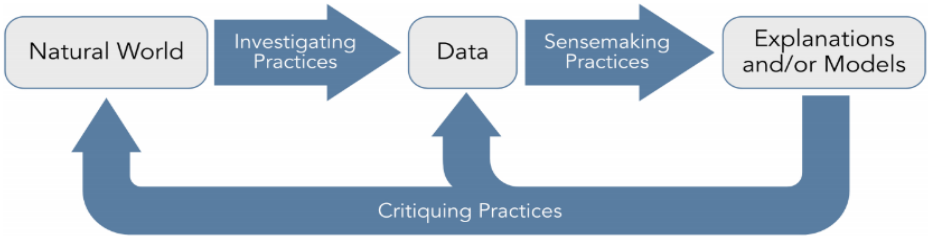
Science 6 — Weather and Climate (4 weeks)

Unit 5 Core Idea: Weather and Climate
Essential Question: How and why is Earth constantly changing?

Supporting Questions:

- What factors interact and influence weather and climate?



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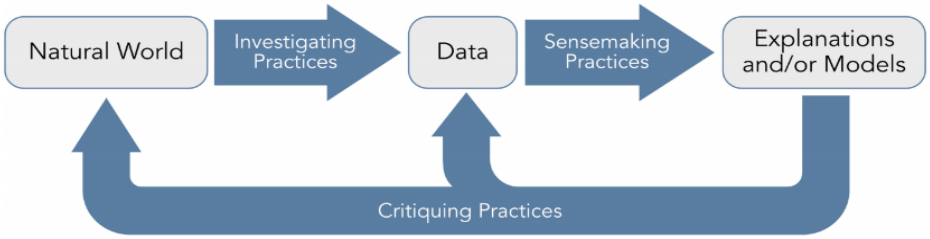
Priority (Practices):	**Supporting (Performance Expectations):**
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena. (06-ESS2-6) **Planning and Carrying Out Investigations** Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions. (06-ESS2-5)	6-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.] 6-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]

Science 6 — Space Systems (6 weeks)

Unit 6 Core Idea: Space Systems
Essential Question: What is the universe, and what is Earth's place in it?

Supporting Questions:

- What is Earth's place in the Universe?
- What makes up our solar system and how can the motion of Earth explain seasons and eclipses?



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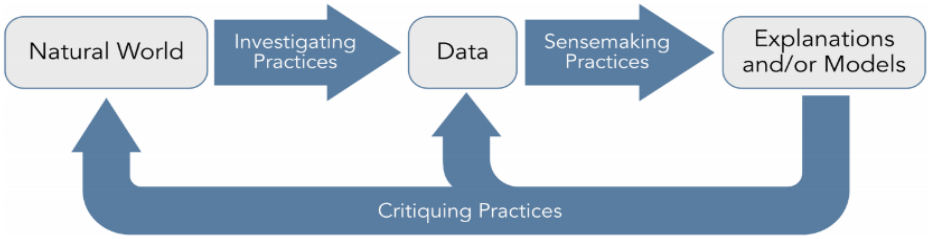
Priority (Practices):	**Supporting (Performance Expectations):**
Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop and use a model to describe phenomena. (06- ESS1-1),(06-ESS1-2) **Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to determine similarities and differences in findings. (06-ESS1-3)	6-ESS1-1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.] 6-ESS1-2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as their school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.] 6-ESS1-3 Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.]

Science 6 Matter and Energy in Organisms and Ecosystems (4 weeks)

Unit 7 Core Idea: Matter and Energy in Organisms and Ecosystems **Essential Question: How and why do organisms interact with their environment and what are the effects of these interactions?**
Supporting Questions:

- How do organisms obtain and use matter and energy?
- How do matter and energy move through an ecosystem?
- How do organisms interact with other organisms in the physical environment to obtain matter and energy?



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Priority (Practices):

Developing and Using Models Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to describe phenomena. (06-LS2-3)

Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to provide evidence for phenomena. (06-LS2-1)

Supporting (Performance Expectations):

6-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

6-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]

6-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]