Broken Arrow Public Schools – 6th Grade Instructional Sequence – Fall Semester

Physical Science	
Topic/Core Idea	
PS1-A: Structure and Properties of Matter	Gases and liquids are made of molecules or inert atoms that are moving about relative to each other. *In a liquid, the molecules are constantly in contact with others *in a gas, they are widely spaced except when they happen to collide. *In a solid, atoms are closely spaced and may vibrate in positions but do not change relative locations.
	The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.
Students who demonstrate understanding can:	
Performance Expectation (Matter and Its Interactions)	**MS-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. (Cross-cutting concept: Cause and effect relationships may be used to predict phenomena in natural or designed systems.)
	Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases 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.
	Assessment Boundary: The use of mathematical formulas is not intended.

Broken Arrow Public Schools – 6th Grade Instructional Sequence – Fall Semester

Physical Science	
Topic/Core Idea	
PS3-A: Definitions of Energy	Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (The formula for KE is 1/2 mv^2, but only knowing the relationships of this formula is required. For example when the mass increases, the kinetic energy increases.)
	A system of objects may also contain stored (potential) energy, depending on their relative positions.
PS3-C: Relationship between Energy and Forces	When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object.
Students who demonstrate understanding can:	
Performance Expectation (Energy)	**MS-PS3-1:** Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. (Cross-cutting concept: Proportional relationships among different types of quantities provide information about the magnitude of properties and processes.) Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a waffle ball versus a tennis ball. Assessment Boundary: Does NOT include mathematical calculations of kinetic energy.
Performance Expectation (Energy)	**MS-PS3-2**: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. (Cross-cutting concept: Models can be used to represent systems and their interactions-such as inputs, processes, and outputs-and energy and matter flows within systems.) Clarification Statement: Emphasis is on relative amounts of potential energy, NOT on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written description of systems. Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.

Physical Science	
Topic/Core Idea	
PS3-A: Definitions of Energy	Temperature is a measure of the average kinetic energy of particles of matter.
	The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.
PS3-B: Conservation of Energy and Energy Transfer	Energy is spontaneously transferred out of hotter regions or objects and into colder ones.
	The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of matter, the size of the sample, and the environment.
Students who demonstrate understanding can:	
Performance Expectation (Energy)	**MS-PS3-3**: Apply scientific principles to design, construct and test a device that either minimize or maximizes thermal energy transfer. (Cross-cutting concept: The transfer of energy can be tracked as energy flows through a designed or natural system.) Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup. Care should be taken with devices that concentrate significant amounts of energy. (e.g. conduction, convection, and/or radiation) Assessment Boundary: Assessment does NOT include calculating the total amount of thermal energy transferred.
Secondary Core Ideas	The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (**Defining and Delimiting an Engineering Problem**)
	A solution needs to be tested, and then modified on the basis of the test results in order to improve it. (**Developing Possible Solutions**)
	There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. (**Developing Possible Solutions**)
Performance Expectation (Energy)	**MS-PS3-4:** Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. (Cross-cutting concept: Proportional relationships among different types of quantities provide information about the magnitude of properties and processes. See **MS-PS3-1**).
	Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.
Possible Support: Conduction, convection and Radiation Stations Kit	Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.

Broken Arrow Public Schools – 6th Grade Instructional Sequence – Fall Semester

Physical Science	
Topic/Core Idea	
PS2-B: Types of Interactions	Forces that act at a distance (electric, magnetic, and gravitational) can be explained by field that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively).
	Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.
Students who demonstrate understanding can:	
Performance Expectation (Motion and Stability: Forces and Interactions)	**MS-PS2-3**: Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. (Cross-cutting concept: Cause and effect relationships may be used to predict phenomena in natural or designed systems. See **MS-PS1-4**.)
	Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.
Possible Support: Electronic Snap Circuits Kit	Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking. Assessment of Coulomb's Law is not intended.
Performance Expectation (Motion and Stability: Forces and Interactions)	**MS-PS2-5:** Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. (Cross-cutting concept: Cause and effect relationships may be used to predict phenomena in natural or designed systems. See **MS-PS1-4**.)
	Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.
Possible Support: Gravity and Magnetism Kit	Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.

Broken Arrow Public Schools – 6th Grade Instructional Sequence – Spring Semester

Life Science	
Topic/Core Idea	
LS1.A: Structure and Function:	All living things are made up of cells, which is the smallest unit that can be said to be alive.
	An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular)
	Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.
Students who demonstrate understanding can:	
Performance Expectation(From Molecules to Organism: Structure and Processes	**MS-LS1-1:** Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. (Cross-cutting concept: Phenomena that can be observed at one scale may not be observable at another scale.)
	Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and not-living cells, and understanding that living things may be made of one cell or many and varied cells.
Possible Support: Plant and Animal Cell Mystery Kit	Assessment boundary: Assessments should provide evidence of students' abilities to identify evidence that living things are made of cells and distinguish between living and nonliving cells.
Performance Expectation(From Molecules to Organism: Structure and Processes	**MS-LS1-2:** Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. (Cross-cutting concept: Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the relationships among its parts, therefore complex natural structures/systems can be analyzed to determine how they function.)
	Clarification Statement: Emphasis is on the cell functioning as a whole system and the **primary role** of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall. Other organelles should be introduced while covering this concept.
	Assessment Boundary: Assessment of the organelle structure/function relationships is limited to the cell was and cell membrane. Assessment of the function of the other organelles is limited to their **relationship to the whole cell**. Assessment does not include the biochemical function of the cells or cell part.

Broken Arrow Public Schools – 6th Grade Instructional Sequence – Spring Semester

Life Science	
Topic/Core Idea	
LS1.A: Structure and Function:	In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.
Students who demonstrate understanding can:	
Performance Expectation (Molecules to Organism: Structure and Processes)	**MS-LS1-3:** Use argument supported by evidence for how the body is a system of interaction s subsystems compose of groups of cells. (Cross-cutting concept: Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.)
	Clarification Statement: Emphasis on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of these systems.
	Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous system
Life Science	
Topic/Core Idea	
LS1.C: Organization for Matter and Energy Flow in Organisms:	Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make surged (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis which also releases oxygen, these sugars can be used immediately or stored for growth or later use.
	The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (I.e., from sunlight to occur.
	In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen.
Students who demonstrate understanding can:	
Performance Expectation (From Molecules to Organisms: Structure and Processes) **Possible Support: Growlab Mobile Garden**	**MS-LS1-6:** Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out to organisms. (Cross-cutting concept: Within a natural system, the transfer of energy drives the motion and/or cycling of matter.)
	Clarification Statement: Emphasis is on tracking movement of matter and flow of energy. (For example, drawing a diagram of the energy flow.)
	Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.

Broken Arrow Public Schools – 6th Grade Instructional Sequence – Spring Semester

Life Science	
Topic/Core Idea	
LS2.C: Ecosystem Dynamics, Functioning, and Resilience:	Ecosystems are dynamic in nature; their characteristics can vary over time.
	Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
Students who demonstrate understanding can:	
Performance Expectation (Ecosystems: Interactions, energy, and dynamics)	**MS-LS2-4**: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. (Cross-cutting concept: Small changes in one part of a system might cause large changes in another part.)
	Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.
	Assessment Boundary: N/A

Life Science	
Topic/Core Idea	
LS2.A: Interdependent Relationships in Ecosystems:	Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors
	In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.
	Growth of organisms and population increases are limited by access to resources.
Students who demonstrate understanding can:	
Performance Expectation (Ecosystems: Interactions, energy, and dynamics)	**MS-LS2-1**: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (Cross-cutting concept: Cause and effect relationships may be used to predict phenomena in natural or designed systems. See **MS-PS1-4**.)
	Clarification Statement: Emphasis is on cause an effect relationships between resources and other individual organisms and the number of organisms in ecosystems during periods of abundant and scarce resources.
	Assessment Boundary: The model should focus on organisms' needs and how resources in the ecosystem meet those needs. Determining the carrying capacity of ecosystems is beyond the intent.

Broken Arrow Public Schools – 6th Grade Instructional Sequence – Spring Semester

Life Science	
Topic/Core Idea	
LS2.B: Cycle of Matter and Energy Transfer in Ecosystem	Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem.
	Transfers of matter into and out of the physical environment occur at every level.
	Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments.
	The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.
Students who demonstrate understanding can:	
Performance Expectation (Ecosystems: Interactions, Energy and Dynamics)	**MS-LS2-3:** Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (Cross-cutting concept: The transfer of energy can be tracked as energy flows through a designed or natural system. See **MS-PS3-3**.)
	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.
Possible Support: Traveling Nitrogen Kit	Assessment Boundary: Assessment does not include the use of chimerical reactions to describe the processes.
Life Science	
Topic/Core Idea	
LS2.A: Interdependent Relationships in Ecosystems:	Predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the others for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments both living and nonliving are shared.
Students who demonstrate understanding can:	
Performance Expectation: (Ecosystems: Interaction, Energy, and Dynamics)	**MS-LS2-2:** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. (Cross-cutting concept: Patterns can be used to identify cause and effect relationships.)
	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 ecosystem. Examples of types of interactions could include competitive, predatory, and mutually beneficial (e.g. competition, predation, parasitism, commensalism, and mutualism.)
Possible Support: Survival Island Activity Kit	Assessment Boundary: Assessment should provide evidence that students can explain the consistency for the interactions of organisms with other organisms and/or the environment across difference t ecosystems (e.g. ocean, forests, wetlands, deserts, terrariums, cities)

Broken Arrow Public Schools – 6th Grade Instructional Sequence – Spring Semester

Life Science	
Topic/Core Idea	
LS2.C: Ecosystem: Interactions, Energy, and Dynamics:	Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems
	The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health
	Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling
	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
Students who demonstrate understanding can:	
Performance Expectations (Ecosystems: Interactions, Energy and Dynamics.	**MS-LS2-5:** Evaluate competing design solutions for maintaining biodiversity and ecosystem services. (Cross-cutting concept: Small changes in one part of a system might cause large changes in another part. See **MS-LS2-4**.)
	Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations
	Assessment boundary: N/A
Influence of Engineering, Technology, and Science on Society and the Natural World:	The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values: by the findings of scientific research and by differences in such factors as climate, natural resources and economic conditions. Thus technology use varies from region to region and over time.

Broken Arrow Public Schools – 6th Grade Instructional Sequence – Spring Semester

Earth Science	
Topic/Core Idea	
ESS3.C: The Roles of Water in Earth's Surface Processes.	Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization and precipitation as well as downhill flows on land.
	Global movements of water and its changes in form are propelled by sunlight and gravity.
Students who demonstrate understanding can:	
Performance Expectations (Earth's Systems)	**MS-ESS2-4:** Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. (Cross-cutting concept: Within a natural system, the transfer of energy drives the motion and/or cycling of matter. See **MS-LS1-6**.)
	Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.
	Assessment Boundary: A quantitative understanding of the latent heart of vaporization and fusion is not assessed.
Earth Science	
Topic/Core Idea	
ES3.C: Human Impacts on Earth Systems:	Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things
	Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.
Students who demonstrate understanding can:	
Performance Expectation (Earth and Human Activity)	**MS-ESS3-3:** Apply scientific principles to design a method for monitoring and minimizing human impact on the environment. (Cross-cutting concept: Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.)
	Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage) such as the withdrawal of water from streams and aquifers or the construction of dams and levees._ land usage (such as urban development, agriculture or the removal of wetlands) and pollution (such as the air, water, or land.)
Influence of Engineering, Technology, and Science on Society and the Natural World:	The use of technologies and any limitations on their use are driven by individual or societal needs, desires, and values: by the findings of scientific research and by differences in such factors as climate, natural resources and economic conditions.