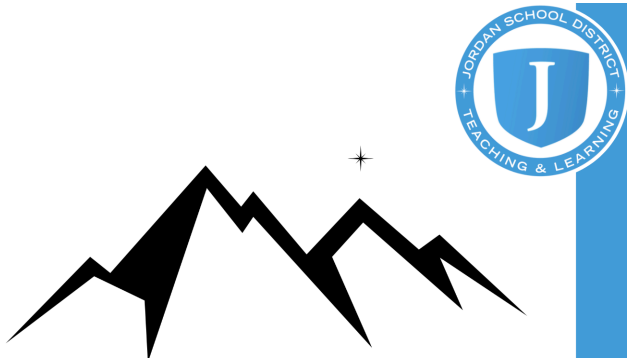
6th Grade Science

Proficiency Scales



General Proficiency Grading Guidelines:

Level 4*: Student exceeds expectation of the standard by utilizing in-depth inferences and applications of the Standards.

Level 3: Student meets expectation by demonstrating understanding of the core ideas and ability to use the science practices in the standard.

Level 2: Student demonstrates knowledge of the simpler details of the core ideas and some ability to use the science practice.

Level 1: Student exhibits minimal knowledge of the simpler details of the core ideas and minimal ability to use the science practice.

*Please note that the list of level 4 descriptors for each standard is not exhaustive, and that students don't need to do everything on the level 4 descriptor list to demonstrate that they are highly proficient.

Each standard includes a science and/or engineering practice. Find a brief description of each practice, along with links to additional information here.

Science Grade 6		
Standard 6.1.1 🔑		
Develop and use a model of the Sun-Earth-Moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. (ESS1.A, ESS1.B)		**Sample Assessments** • USBE Formative Assessment - Moon Phases • USBE Formative Assessment - Seasons • GSD Sample Assessment - Seasons
		Sample Tasks
Level 4	• Compare the limitations and merits of two or more models of the Sun-Earth-Moon system. • Develop a model to explain why lunar and solar eclipses do not occur each month. • Use mathematical thinking to determine which parts of the Earth receive the most direct sunlight during different seasons. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Develop both a 3D model and 2D model to explain the reason for Earth's seasons. Explain the limitations and merits of each model. • Build a physical model that shows how the plane of the moon's orbit affects when we will experience a lunar eclipse. • Students use materials to investigate how the tilt of the earth affects the amount of surface area that light from the sun covers (they should discover that a beam of light that hits the Earth when it is tilted toward the sun is smaller), and then use computational thinking to identify cause and effect relationships between the surface area that the light spreads out over and the season. • Explain how scale limits the Sun-Earth-Moon models used in class.
Level 3	• **Develop and use a model** of the Sun-Earth-Moon system to explain the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. Examples of models could be physical, graphical, or conceptual. • Evaluate the limitations and/or merits of models of the Sun-Earth-Moon system.	• Use a globe, ball, and light bulb to model the cyclic pattern of moon phases, and model solar and lunar eclipses. • Use a computer model to investigate the Earth-moon-sun system. Students could compare the computer model to models they developed. • Create a model with a light bulb and globe to explain why the seasons are opposite in the northern and southern hemispheres. • Develop and use a 3D or 2D model to explain what causes Earth's seasons. Explain the limitations and/or merits of each model. • Use a computer model to investigate what causes the seasons. This computer model allows students to investigate how changing the tilt of the Earth to 0^{o} would impact the seasons.
Level 2	• Develop a model that shows the relative position of the sun, moon, and Earth, but only partially explains lunar phases, eclipses, or the seasons. • Describe how the seasons are opposite in the northern and southern hemispheres. • Explain the pattern of lunar phases and/or eclipses.	• Watch an animation or computer simulation then model the lunar phases and describe the location of the moon, Earth, and sun during different moon phases. • Observe and record the moon phases for one week, then predict the next week's moon phases based on patterns. • Draw and/or use a model of the seasons with partial explanation.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	

Science Grade 6		
Standard 6.1.2 🔑		
Develop and use a model to describe the role of gravity and inertia in orbital motions of objects in our solar system. (ESS1.B)		**Sample Assessments** • USBE Formative Assessment - Jupiter's Moons
		Sample Tasks
Level 4	• Develop a use model to predict the structure of another system in the universe based on the understanding of gravity and inertia. • Develop and use a model of a student-created system and explain the role of gravity and inertia in their system. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Create a model to show various systems of gravitational interaction within the Milky Way galaxy (i.e planets orbit stars, stars orbit the center of the galaxy). • Use computational thinking to construct an explanation how changes in mass would affect the gravity and inertia to cause a planet to collide or fly out of orbit. • Use data to create a graphical model explaining how a planet's distance from the sun relates to its orbital velocity. http://elemscience.jordandistrict.org/files/6.3.3.1.8-Clark-Planetarium-Solar-System-Fact-Sheet-2008.pdf
Level 3	• **Develop and use a model** to describe the role of gravity and inertia in orbital motions of objects in our solar system. • Develop and use a model to describe that gravity is an inward pulling force that keeps less massive objects in orbit around more massive objects.	• Create a 2D model that shows how the gravity of the sun and inertia of a planet interact to keep the planet in orbit. • Explain what would happen to the orbit of a planet if the sun's mass increased or decreased. Use evidence gathered from a computer model in the explanation. For example, https://phet.colorado.edu/en/simulation/gravity-and-orbits.
Level 2	• Develop a model to demonstrate that gravity is a pulling force between two objects. • Explain that all moving objects have inertia. • Provide examples of objects in the solar system that orbit one another.	• Use a computer simulation to show that gravity is a pulling force (https://phet.colorado.edu/en/simulation/gravity-force-lab). • Identify examples of objects in the solar system that orbit other objects. • Create a diagram of the solar system that shows the position of celestial objects.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	

Science Grade 6		
Standard 6.1.3 🔑		
Use **computational thinking** to **analyze data** and determine the scale and properties of objects in the solar system. (ESS1.A, ESS1.B)		**Sample Assessments** • USBE Formative Assessment - Moons and Planets • GSD Assessment - Scale of the Solar System
		Sample Tasks
Level 4	• Use computational thinking to develop two or more scale models in different measurement systems, that show the relative size and distance of objects in the solar system. • Analyze data about an unknown object to determine how it should be classified. • Use data to identify patterns in the properties of objects in the solar system. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Use mathematical reasoning to develop a scale model of the solar system that will fit on the playground, and a scale model that will fit on 4 meters of adding machine tape. • Given data of the properties for a celestial object discovered near Jupiter, determine its classification. Construct an argument based on evidence from the data. • Graph data of a planet's properties and identify relationships among the properties. • Given data on a fictional object, determine how it should be classified and where it would be in the solar system. Use data on existing objects to support the classification and placement of the object.
Level 3	• **Use computational thinking** to determine a scale that models the relative size and/or distance of objects in the solar system. • **Use computational thinking** to **analyze data** to identify properties of objects in the solar system. Examples of properties could include layers, temperature, surface features, and orbital radius. Data sources could include Earth and space-based instruments such as telescopes and satellites. Types of data could include graphs, data tables, drawings, photographs, and models.	• Using the data about the planets' distance from the sun in astronomical units, develop a scaled model of the solar system; the model could be graphical, a 2D diagram, or 3D. • Use data to develop a 3D model (clay) of the relative sizes of the planets. http://www.exploratorium.edu/ronh/solar_system/
Level 2	• Explain that objects in the solar system vary in size, temperature, distance from the sun, surface features, and orbital radius. • Use computational thinking to determine a scale that partially represents the relatives size or the distance of objects in the solar system. • Use data to answer questions about objects in the solar system.	• Sort pictures of solar system objects into categories based on their properties. • Given a data chart, ask and answer questions about the properties of planets in our solar system.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	

Grade 6 Science

Standard 6.2.1 🔑

Develop models to show that molecules are made of different kinds, proportions and quantities of atoms. Emphasize understanding that there are differences between atoms and molecules, and that certain combinations of atoms form specific molecules. Examples of simple molecules could include water (H_2O), atmospheric oxygen (O_2), and carbon dioxide (CO_2). (PS1.A)

Sample Assessments

- USBE Formative Assessment - Hydrogen Peroxide

		Sample Tasks
Level 4	• Use computational thinking to determine the quantities of atoms needed to model molecules. • Use models to construct an explanation using examples to support the claim that different combinations of atoms form molecules with unique properties. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Given the chemical formula for a molecule, such as methane (CH_4), students calculate how many molecules could be made from available atoms, or how many atoms of each element are needed to make a certain number of molecules. • Write an explanation of why two substances that are made of the same elements have different properties. For example, carbon dioxide and carbon monoxide (CO_2 and CO), water and hydrogen peroxide (H_2O and H_2O_2), or oxygen and ozone (O_2 and O_3). • Construct an explanation for why altering a carbon dioxide molecule by removing an oxygen atom, creates a substance with different properties.
Level 3	• **Develop and use a mode**l to show that molecules are made of different kinds, proportions, and quantities of atoms. • Explain that certain combinations of atoms form specific molecules.	• Given the chemical formula for simple molecules, such as water, oxygen, and carbon dioxide, make a 2D or 3D model with the correct proportion and quantity of atoms. • Given the chemical formula of a molecule, evaluate whether a provided 2D or 3D model represents that molecule.
Level 2	• Explain the difference between an atom and a molecule. • Determine the quantity of atoms and proportion of atoms in a given model of a molecule. • Use a model of a molecule to identify its chemical formula.	• Given a set of models identify which models show atoms and which models show molecules. • Count the number of atoms given a model of molecule. • Describe the proportions of the types of atoms found in a given model of a molecule (e.g. H_2O has 2 hydrogen and one oxygen).
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	

Grade 6 Science		
Standard 6.2.2 🔑		
Develop a model to predict the effect of heat energy on states of matter and density. Emphasize the arrangement of particles in states of matter (solid, liquid, or gas) and during phase changes (melting, freezing, condensing, and evaporating). (PS1.A, PS3.A)		**Sample Assessments** • USBE Formative Assessment - Snow to Dry Ground • GSD Formative Assessment - Lake Layers
		Sample Tasks
Level 4	• Explain real-world examples of how matter expands or contracts by modeling the relationship between heat energy, particle motion, and density. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Construct an explanation for why ice floats based on the arrangement of water molecules in a liquid and a gas. • Develop a model to show why putting a metal lid under hot water makes a jar easier to open.
Level 3	• Develop a model that shows the arrangement of particles in states of matter and during phase changes. • Develop a model to explain how the arrangement of particles in a substance and the density of a substance is affected by adding or removing heat energy.	• By drawing or using objects, create models to show particle motion and arrangement of particles in each state of matter. • Create a labeled diagram to show how particle motion and arrangement changes when heat energy is added and removed. • Kinesthetically model how the density of a substance will change when heat energy is added and removed.
Level 2	• Name the states of matter and the processes involved in phase changes. • Explain what happens to a substance's state of matter when heat energy is added or removed. • Use a model to explain the arrangements of molecules in gases, liquids, and solids. • Use a model to explain how the arrangement of molecules in a substance relates to the substance's density.	• Given pictures of particle arrangement in a solid, liquid, and gas, identify the state of matter. • Given models of substances showing the arrangement of particles, order the models from most dense substance to least dense substance. • Use computer simulations to explain how the arrangement of particles changes when heat energy is added or removed.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	

Grade 6 Science

Standard 6.2.3 🔑

Plan and carry out an investigation to determine the relationship between temperature, the amount of heat transferred, and the change of average particle motion in various types or amounts of matter. Emphasize recording and evaluating data, and communicating the results of the investigation. (PS3.A)	**Sample Assessments** • USBE Formative Assessment - Thermal Energy • GSD Summative Assessment

		Sample Tasks
Level 4	• Plan and carry out an investigation to answer a real-world question or solve a community problem involving heat transfer and/or temperature changes. • Evaluate the experimental design of multiple investigations to determine which design will provide stronger evidence to support a claim. • Evaluate the results of an investigation to improve the investigation in order to gather new data and/or evidence to support a claim. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Design and conduct an investigation to determine which type of flooring to use in a house that uses radiant heat. • Compare two experiments to determine which design provides more reliable data to determine how the amount of heat transfer needed to change the temperature of matter depends on the quantity of matter.
Level 3	• Plan and carry out a controlled investigation to determine the relationship between the amount of heat transferred and the type or amount of matter. • Collect and record changes in temperature to investigate the amount of heat transferred during an investigation. • Organize and evaluate data to communicate the results of the investigation. • Use the results of an investigation to explain the relationship between particle motion, thermal energy and heat.	• Write an investigation plan that includes the relationships that will be tested, the experimental design, and a plan for the data that will be collected. • Conduct a controlled investigation and measure and record data at predetermined intervals. • Graph data collected from students' own investigations in order to identify relationships and use those relationships to communicate the results of the investigation.
Level 2	• Define temperature as the average particle motion in a substance. • Describe the direction of heat transfer from warmer to cooler objects. • Conduct an investigation which includes measuring and recording temperature changes. • Identify the independent variable, dependent variable, and controls in a simple investigation.	• Observe heat transfer between objects and the environment to make inferences about the direction of heat transfer. • Follow given procedures to conduct a simple investigation involving heat transfer, including measuring and recording temperature data, and identifying variables and controls.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	

Grade 6 Science

Standard 6.2.4

Design *an object, tool, or process* that minimizes or maximizes heat energy transfer. Identify criteria and constraints, develop a prototype for iterative testing, analyze data from testing, and propose modifications for optimizing the **design solution**. Emphasize demonstrating how the structure of differing materials allows them to function as either conductors or insulators. (PS3.A, PS3.B, ETS1.A, ETS1.B, ETS1.C)

Sample Assessments

- USBE Formative Assessment - Temperatures in a House

		Sample Tasks
Level 4	● Predict and justify the effectiveness of a conductor or insulator in a real world object tool or process based on data and an understanding of heat transfer. ● Evaluate different design solutions to determine how well each solution met the criteria and constraints of the design challenge. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	● Construct an explanation for how a Yeti cup can keep ice in a drink for an entire day, by applying an understanding of insulation and heat transfer. ● Compare data from tests of two different tools designed to keep a hot drink warm to evaluate which solution best meets the criteria and constraints of the design challenge.
Level 3	● Design a tool, object or process that minimizes or maximizes heat transfer and use scientific principles to justify my design. ● Use the iterative process of testing and modification to optimize my solution based on criteria and constraints. ● Explain why some materials function as conductors and others as insulators based on their structure.	● Design a container that will keep a hot drink warm, conduct tests to determine the effectiveness of the design, modify the design to better meet the criteria and constraints of the design challenge. ● Construct an explanation for why their designed tool or process minimizes heat transfer based on data from testing and applying reasoning about heat transfer.
Level 2	● Design a tool that minimizes or maximizes heat transfer and gather data about the effectiveness of the tool. ● Explain how conductor and an insulator affect heat transfer. ● Identify examples of insulators and conductors and the differences between them.	● Test materials to determine whether they act as thermal conductors or insulators. ● Design a cup that will keep a hot drink warm.
Level 1	● With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	

Grade 6 Science		
Standard 6.3.1 🔑		
Develop a model to describe how the cycling of water through Earth's systems is driven by energy from the sun, gravitational forces, and density. (ESS2.C)		**Sample Assessments** • USBE Formative Assessment - Water from a Glacier • GSD Formative Assessment - Water Cycle Model
		Sample Tasks
Level 4	• Apply an understanding of how energy and matter interact in the water cycle to explain everyday phenomena such as the formation of fog over a pond or snowfall on the peaks of mountains. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Create a cause and effect flow chart to explain how changes in energy form fog. • Write an explanation for how mountains affect precipitation totals based on an understanding of how air and landforms interact.
Level 3	• Develop a model to describe how the cycling of water through Earth's systems is driven by energy from the sun, gravitational forces, and density.	• Create an explanatory model to show how solar energy and gravity drive the cycling of water between oceans, the atmosphere, and land. Models could include annotated diagrams, flowcharts, simulations, or physical models.
Level 2	• Label components of the water cycle including processes and the state of water at different locations in the cycle. • Define major processes of the water cycle (i.e. evaporation, condensation, precipitation)	• Given a typical model of the water cycle, identify where evaporation, condensation, and precipitation occur and states of water in different locations (ice, liquid, vapor). • Observe demonstrations of evaporation and condensation to explain how water changes state during these processes.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard.	

Grade 6 Science		
Standard 6.3.2 🔑		
Investigate the interactions between air masses that cause changes in weather conditions. Collect and **analyze data** to provide evidence for how air masses flow from regions of high pressure to low pressure causing a change in weather. Examples of data collection could include field observations, laboratory experiments, weather maps, or diagrams. (ESS2.C, ESS2.D)		**Sample Assessments** • USBE Formative Assessment - Changing Weather • GSD Sample Assessment - Weather Forecast
		Sample Tasks
Level 4	• Construct an explanation for how landforms and oceans affect the distribution and movement of air masses. • Collect data from research to serve as evidence for how interactions between air masses can result in severe weather. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Develop a model to show how air pressure differences can cause strong easterly winds in the Salt Lake Valley. • Construct an explanation supported by evidence for why more tornadoes occur in Kansas than in Utah.
Level 3	• Investigate the interactions between air masses that cause changes in weather conditions. • Collect and analyze weather data to provide evidence for how air masses flow from regions of high pressure to low pressure causing a change in weather.	• Using a model, explain how air masses interact at a front to create storms. • Analyze data collected over time to identify patterns that indicate changes in weather conditions.
Level 2	• Collect and organize weather data in order to identify basic patterns. • Define and describe weather factors that can be measured (i.e. temperature, humidity, wind speed and direction, air pressure).	• Gather information about weather conditions across the US by using weather maps. • Collect and organize data from online weather sites over a period of time.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard.	

Grade 6 Science		
Standard 6.3.3 🔑		
Develop and use a model to show how unequal heating of Earth's systems cause patterns of atmospheric and oceanic circulation that determine regional climates. Emphasize how warm water and air move from the equator toward the poles. Examples of models could include Utah regional patterns such as lake-effect and wintertime temperature inversions. (ESS2.C, ESS2.D)		**Sample Assessments** • USBE Formative Assessment - Rubber Ducks • GSD Assessment - Comparing Climate • GSD Assessment - Factors that Affect Climate
		Sample Tasks
Level 4	• Construct an explanation for a specific location's typical climate based on multiple lines of evidence. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Write an explanation supported by evidence and reasoning for why Quito, Ecuador experiences cool temperatures even though it is located near the equator.
Level 3	• Develop and use a model to show how unequal heating of Earth's systems cause patterns of atmospheric and oceanic circulation that determine regional climates. • Explain how energy changes cause warm water and air move from the equator toward the poles.	• Use a model of convection to explain how heat energy results in the cycling of air in the atmosphere and water in the oceans. • Create a storyboard or flowchart model to describe the conditions that cause lake effect snow. • Analyze data to determine how ocean currents affect regional climates.
Level 2	• Identify the relationship between climate and latitude. • Describe the difference between the climates of coastal and inland areas. • Describe how temperature changes with altitude. • Differentiate between weather and climate.	• Compare average mean temperatures and identify patterns for locations across the globe. • Analyze data to show the coastal areas have smaller changes in temperatures than inland areas. • Analyze a map of oceanic currents to describe general patterns.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard.	

Grade 6 Science		
Standard 6.3.4		
Construct an explanation supported by evidence for the role of the natural greenhouse effect in Earth's energy balance, and how it enables life to exist on Earth. Examples could include comparisons between Earth and other planets such as Venus and Mars. (ESS2.D)		**Sample Assessments** • USBE Formative Assessment - Atmosphere of Mars • GSD Assessment - Explanatory Model • GSD Assessment - Explanatory and Graphical Models
		Sample Tasks
Level 4	• Predict how changes in radiation received from the Sun and changes to Earth's atmosphere would affect Earth's energy balance based on evidence and reasoning. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Write an argument, based on evidence and reasoning related to the greenhouse effect for how changes would affect Earth's energy balance.
Level 3	• Construct an explanation supported by evidence for the role of the natural greenhouse effect in Earth's energy balance, and how it enables life to exist on Earth.	• Use data about atmospheric composition and temperature ranges to compare the greenhouse effect on Earth, Venus, and Mars. • Develop a model to show how energy interacts with matter in the atmosphere to maintain Earth's energy balance.
Level 2	• Describe how radiation from Sun heats the Earth. • Describe how the presence of an atmosphere helps a planet stay warm.	• Conduct an investigation to compare temperature changes in an open and closed system (i.e. an uncovered glass jar and a glass jar covered with plastic wrap). • Summarize the information about Earth's atmosphere gathered from texts.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard.	

Grade 6 Science

Standard 6.4.1

Analyze data to provide evidence for the effects of resource availability on organisms and populations in an ecosystem. Ask questions to predict how changes in resource availability affects organisms in those ecosystems. Ask questions to predict how changes in resource availability affects organisms in those ecosystems. Examples could include water, food, and living space in Utah environments. (LS2.A)		**Sample Assessments** • USBE Formative Assessment - Zebra Mussels • GSD Assessment
		Sample Tasks
Level 4	• Ask questions and gather and analyze data to predict what caused a population to change over time. • Ask questions and make predictions about how changes in the availability of resources will affect organisms and populations in an ecosystem. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Research a population of organisms that has increased or decreased, and relate the change in the population to the availability of a specific resource (e.g. decline of the June sucker fish in Utah Lake, decline of cattails in Utah wetlands). • Create a graph predicting how a change in a resource will affect an ecosystem's status quo in animal and plant populations.
Level 3	• Analyze data to provide evidence for the effects of resource availability on organisms and populations in an ecosystem. • Ask question to predict how changes in resource availability affects organisms in those ecosystems.	• Compare data on population changes and changes in resources to make a claim about why a population has changed over time. • Complete an online simulation to gather data about how changes to resource availability affect populations.
Level 2	• Identify patterns in data to describe how a population changes over time. • Identify patterns in data to describe how resource availability changes over time. • Name resources that organisms need to survive in an ecosystem.	• Given a data set (table, graph) that shows changes in a population over time, describe the overall trends. • Given a data set (table, graph) describe how a resource such as water, space, or food has changed over time. • Create a model to show that organisms need food, water, and space to survive.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard.	

Grade 6 Science		
Standard 6.4.2		
Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. Emphasize consistent interactions in different environments, such as competition, predation, and mutualism. (LS2.A)		**Sample Assessments** • USBE Formative Assessment - Moose and Beavers • GSD Assessment - Isle Royale
		Sample Tasks
Level 4	• Predict how interactions (competition, predation, mutualism, parasitism, and commensalism) between organisms change as a result of changes in resource availability in an ecosystem. • Analyze data to explain the interactions among organisms in ecosystems. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Research patterns of interactions in an ecosystem; use reasoning to predict two or more changes in interactions that would occur if resource availability changed. • Students use data on organisms in one ecosystem (for example, data on the change in the beaver population after wolves were reintroduced to Yellowstone) to support a prediction about interactions in an analogous ecosystem.
Level 3	• Predict interactions between organisms in an ecosystem based on patterns of interactions in different ecosystems. • Explain that there are reliable patterns of interactions between organisms in an ecosystem and that those patterns exist across various ecosystems.	• Use websites, media, and articles to research two different ecosystems. Create a model to show patterns of interactions including predation, competition, mutualism, and parasitism in each ecosystem.
Level 2	• Explain that organisms interact with other organisms in their ecosystem. • Define and provide examples of predation, competition and mutualism.	• Analyze information in a short video clip of an ecosystem to identify an example of predation, competition, or mutualism. • Read about an example of mutualism and write an explanation for how organisms involved benefit.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard.	

Grade 6 Science

Standard 6.4.3 🔑

Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Emphasize food webs and the role of producers, consumers, and decomposers in various ecosystems. Emphasize food webs and the role of producers, consumers, and decomposers in various ecosystems. Examples could include Utah ecosystems such as mountains, Great Salt Lake, wetlands, and deserts. (LS2.B)

Sample Assessments

- USBE Formative Assessment - Fish Tank

		Sample Tasks
Level 4	• Develop a model and use it to explain factors that change the amount of available energy in a food web. • Use a model to predict how changing the energy inputs will affect the living and nonliving parts of the ecosystem. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Create a model (drawing or kinesthetic) to show how the amount of available energy changes as it moves through a food web. Use the model to relate biomass to available energy.
Level 3	• Develop a model and use it to explain the cycling of matter and flow of energy through an ecosystem. • Use the model to explain how matter and energy is transferred between producers, consumers, decomposers and nonliving components (water, minerals, air) of an ecosystem.	• Draw a food web for an ecosystem based on information about feeding relationships. Write an explanation for how energy flows from the sun, through the food web, and for how matter cycles in the food web model.
Level 2	• Describe the feeding relationships in a given food web. • Explain the role of energy from the sun in a food web. • Define producer, consumer and decomposer. • Identify the producers, consumers, and decomposers in a given food web.	• Given a food web, describe the feeding relationships that the food web shows. • Annotate a food web to identify producers, consumers, and decomposers. Explain the role of each in the ecosystem.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard.	

Grade 6 Science		
Standard 6.4.4 🔑		
Construct an argument supported by evidence that the stability of populations is affected by changes to an ecosystem. Emphasize how changes to living and nonliving components in an ecosystem affect populations in that ecosystem. Emphasize how changes to living and nonliving components in an ecosystem affect populations in that ecosystem. Examples could include Utah ecosystems such as mountains, Great Salt Lake, wetlands, and deserts. (LS2.C)		**Sample Assessments** • USBE Formative Assessment - Bears
		Sample Tasks
Level 4	• Ask questions and investigate how changes in a specific ecosystem have affected the stability of that ecosystem over time. • Make a claim supported by evidence about how changes in populations in one ecosystem changes the stability of another ecosystem. *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Research an invasive species (e.g. pine bark beetles) in order to construct an explanation for how the outbreak has affected an ecosystem in Utah. • Write an explanation for how the introduction of an invasive species has impacted an ecosystem and other surrounding ecosystems.
Level 3	• Construct an argument using evidence to support a claim that changes to living or nonliving components in an ecosystem will affect the stability of populations in that ecosystem.	• Write an explanation for how changes in salinity levels in Great Salt Lake would affect brine shrimp and migratory bird populations. • Predict how a drought would affect a specific ecosystem based on an understanding of the organisms found in that ecosystem.
Level 2	• Identify the types of changes to living and nonliving components that will affect the populations in an ecosystem. • Provide examples of living and nonliving components in an ecosystem.	• Read about changes to ecosystems and discuss how those changes affect the populations of organisms in those ecosystems. • Classify components of an ecosystem as living and nonliving.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	

Grade 6 Science

Standard 6.4.5

Evaluate competing design solutions for preserving ecosystem services that protect resources and biodiversity based on how well the solutions maintain stability within the ecosystem. Emphasize **obtaining, evaluating, and communicating information** of differing design solutions. Examples could include policies affecting ecosystems, responding to invasive species or solutions for the preservation of ecosystem resources specific to Utah, such as air and water quality and prevention of soil erosion. (LS2.C, LS4.D, ETS1.A, ETS1.B, ETS1.C)

Sample Assessments

- USBE Formative Assessment - Dyer's Wood

		Sample Tasks
Level 4	• Use research to investigate a current problem that affects an ecosystem. Identify the constraints and criteria, evaluate possible solutions and justify a solution based on the research. • Compare and contrast criteria and constraints of different solutions for an identified problem within an ecosystem, and engage in argument for which solution should be used to solve the problem. . *Please note that this list of level 4 descriptors is not exhaustive; there are many ways students could demonstrate that they are highly proficient. Please see this document for additional ideas.*	• Identify a current problem, such as pollution or invasive species, research criteria, constraints, and proposed solutions for the problem. Create an infographic that shares the problem, criteria, and constraints and a proposed solution.
Level 3	• Research and communicate a variety of design solutions for a specific problem that involves maintaining an ecosystem's stability. • Justify **t**he most effective design solution for the problem using criteria and constraints.	• Create a presentation about changes to Great Salt Lake which includes proposed solutions for maintaining the lake's water levels. • Compare and contrast proposed solutions for reducing air pollution in Salt Lake Valley based on criteria and constraints.
Level 2	• Define ecosystem services and biodiversity. • Given a specific context identify a problem that will affect the stability of the ecosystem. • Identify the criteria and constraints of a design problem.	• List examples of ecosystem services including recreation, water quality, and biodiversity. • Given a problem that affects a local ecosystem, identify some possible criteria and constraints in addressing the problem.
Level 1	• With help, student exhibits a partial knowledge of some of the simpler details and processes of the standard	