FOSS Phenomena

Planetary Science

Standard	Focus Question	Phenomena
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. Examples of models could be physical, graphical, or conceptual.	**Investigation 4** Part 1, Part 2, Part3 Investigation 2 Part 1, Part 2 and Part 3	**Investigation 4** **Part 1, Part 2, and Part 3** **Investigation 2** **Part 1, Part 2, and Part 3**
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.	Student Text 54-57	The Earth is held in orbit around the sun. Why do all the planets stay in orbit around the sun?
6.1.3: Use computational thinking to **analyze data** and determine the scale and properties of objects in the solar system. Examples of scale could include size and distance. 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.	**Investigation 7** Part 1	**Investigation 7** Part 1

Matter and Energy

Standard	FOSS Focus Question	Phenomena
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).		

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).	**Investigation 2** **Part 1** How does pressure affect air? **Investigation 3** **Part 2** How does heat affect density of fluids? **Part 3** How do gases flow in the atmosphere? **Investigation 5** **Part 1** How does energy move through materials? Investigation 6 **Part 2** How does energy from the Sun affect wind on Earth?	**Investigation 2** **Part 1** Air is affected by pressure. What effects does pressure have on air? **Investigation 3** **Part 2** Hot water is less dense than cold water. Why does hot water rise to the surface and cold water sink? **Part 3** Gases in our atmosphere move. How do the gases in our atmosphere flow? **Investigation 5** **Part 1** How does heat circulate through materials on Earth? **Investigation 6** **Part 2** Energy from the sun contributes to wind on Earth. What other causes, effect wind movement on Earth?
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.	**Investigation 4** **Part 3** What factors affect the surface temperature on Earth? **Investigation 7** **Part 1** Is there water vapor in the air? **Part 2** How does energy transfer when water changes phase? **Part 3** What causes clouds to form?	**Investigation 4** **Part 3** Earth's temperatures are mild. What causes the Earth to have temperatures that support life? **Investigation 7** **Part 1** There is vapor in the air How can we prove there is vapor in the air? **Part 2** Energy is transferred when water changes phase. How can we trace energy transfer through phase changes? **Part 3** Clouds form from water vapor. Why do we have clouds in our sky?
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*	**Investigation 5** **Part 2** How can you reduce energy transfer to or from a model home? **Part 3** How can we design a more efficient way to decrease energy transfer between a model home and the environment?	**Investigation 5** **Part 2** Energy transfer can be reduces in the model home. How can you reduce energy transfer in your own home? **Part 3**

*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.		How can we design a more efficient way to decrease energy transfer between a model home and the environment?

Weather

Standard	FOSS Focus Question	Phenomena
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.	**Investigation 8** **Part 1** What is the water cycle? **Part 2** What affects the direction that ocean water flows? **Part 3** How does the ocean affect climate on land?	**Investigation 8** **Part 1** Water cycles through Earth's Spheres. Where does our water come from and where does it go? **Part 2** Ocean water flows in predictable patterns What causes ocean water to flow in predictable patterns? **Part 3** Oceans affect climate. How does living near the ocean impact the climate?
6.3.2: 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. Examples of data collection could include field observations, laboratory experiments, weather maps, or diagrams.	**Investigation 2** **Part 2** What happens when two areas of air have different pressures? **Investigation 6** **Part 3** What affects the direction of global winds? **Investigation 10** **Part 2** What makes weather happen?	**Investigation 2** **Part 2** Changes in weather are caused by changes in air pressure. What causes the changes in weather? **Investigation 6** **Part 3** Global winds flow in predictable patterns. Why do winds blow in predictable patterns? **Investigation 10** **Part 2** Changes in weather are caused by several factors. What factors effect the changes in weather?
6.3.3: Develop and use a model to show how unequal heating of the Earth's systems causes patterns of atmospheric and oceanic circulation that determine	**Investigation 4** **Part 2** How does the Sun affect the temperature of locations on Earth? **Investigation 3** **Part 1**	**Investigation 4** **Part 2** The sun heats different parts of the Earth differently. What causes different temperatures on Earth? **Investigation 3**

regional climates. Emphasize how warm water and air move from the equator toward the poles. Examples of models could include Utah regional weather patterns such as lake-effect snow and wintertime temperature inversions.	What is the relationship between layering of fluids and density? **Investigation 6** **Part 3** What affects the direction of global winds?	**Part 1** Our weather is impacted because there is a difference in density in our waters. How does density impact our weather? **Investigation 6** **Part 3** There is a cause and effect relationship among Earth's movements, sun's energy and global wind patterns. What causes the global wind patterns?
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.	**Investigation 10** **Part 1** What information can you get from a weather map? **Planetary Science** **Investigation 7** **Part 2** Which planet is most like Earth?	**Investigation 10** **Part 1** I can read a weather map to explain the current weather conditions and forecast the weather. How can I use a weather map to explain the current conditions and forecast the weather? **Planetary Science** **Investigation 7** **Part 2** There is a cause and effect relationship between atmosphere and planetary temperatures. What causes planets to hold in more heat or hold in less heat?

Ecosystems

Standard	Focus Question	Phenomena
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. Examples could include water, food, and living space in Utah environments.	**Investigation 1** **Part 1** What does a population of milkweed bugs need to survive in a classroom? **Part 2** What needs to be considered when building a habitat for milkweed bugs? **Part 3** How do milkweed bugs reproduce and grow?	Investigation 1 Part 1 Milkweed bugs need certain biotic and abiotic things to survive. What do milkweed bugs need to survive? Part 2 Milkweed bugs need certain things in their habitat. What do milkweed bugs need in their habitat? Part 3 Milkweed bugs' population changes? How do milkweed bugs' population change?
6.4.2: Construct an explanation that predicts patterns of interactions among	**Investigation 2** **Part 1**	**Investigation 2** **Part 1**

organisms across multiple ecosystems. Emphasize consistent interactions in different environments, such as competition, predation, and mutualism.	What is the relationship between individuals, populations, communities, and abiotic factors in an ecosystem? **Investigation 3** **Part 1** What are the different biotic and abiotic components of the Mono Lake ecosystem? **Part 2** How do the organisms at Mono Lake interact? **Investigation 6** **Part 1** What are the kinds of work you do that require energy? **Part 2** What is needed to sustain a food chain? **Part 3** How does biomass and energy flow through an ecosystem? **Part 4** What happens to the energy stored in the biomass of an organism when it dies?	There is a relationship between individuals, populations, communities and abiotic factors. Why are abiotic factors, communities and populations important to an individual? **Investigation 3** **Part 1** Mono Lake has biotic and abiotic factors. What biotic and abiotic factors are a part of Mono Lake? **Part 2** Organisms at Mono Lake are dependent on each other. How are the organisms at Mono Lake dependent on each other? Investigation 6 **Part 1** Energy is required for work. What do we do with energy? **Part 2** Energy flows through a food chain. How does energy from the sun supply energy to the consumer? **Part 3** Energy flows through an ecosystem. How does energy from the sun supply energy to a deer, and then back to a flower? **Part 4** How does a deer provide energy to a mushroom?
6.3.4: 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. Examples could include Utah ecosystems such as mountains, Great Salt Lake, wetlands, and deserts.	**Investigation 5** **Part 1** What is the effect of light on producers? **Part 2** How do producers grow and increase biomass? **Part 3** What are the roles of specific producers in the ecosystem? **Part 4**	**Investigation 5** **Part 1** Producers need light Why do plants need light? **Part 2** Producers increase in mass. How do plants grow? **Part 3** Producers play a specific role in the ecosystem. Why do we need plants? **Part 4**

	How can we model and measure energy transfer from food?	Measurable amounts of energy is stored in plants that is transferred to the consumer. How does energy from the sun move through the food chain, and how can we measure it?
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. Examples could include Utah ecosystems such as mountains, Great Salt Lake, wetlands, and deserts.	**Investigation 4** **Part 3** What interactions and changes have taken place in the terrariums and aquariums? **Investigation 7** **Part 1** What factors affect how many milkweed bugs could be in your habitat at the end of a year? **Part 2** What limiting factors affect algae and brine shrimp populations at Mono Lake? **Investigation 8** **Part 1** Why is biodiversity important in an ecosystem? **Part 2** What can happen when a species is introduced to an ecosystem? **Part 3** What impact have people had on Mono Lake?	**Investigation 4** **Part 3** Interactions and changes in one part of the terrarium/aquarium create changes in other parts of the terrarium/aquarium. How do interactions and changes in one part of the terrarium/aquarium create changes in other parts of the terrarium/aquarium? **Investigation 7** **Part 1** Biotic and abiotic factors affect milkweed bug populations. What affect the growth and reproduction of milkweed bugs? **Part 2** Limiting factors affect algae and brine shrimp populations at Moon Lake. What factors affect algae and shrimp? How does it affect them? **Investigation 8** **Part 1** Biodiversity is important to an ecosystem. Why is a stable, healthy ecosystem usually have many different species? **Part 2** Changes happen when a species is introduced to an ecosystem. What can happen to an ecosystem when a new species is brought in? **Part 3** People have impacted Moon Lake. What impact have people had on Moon Lake?
6.4.5: *Evaluate competing design solutions* for preserving ecosystem services that	**Investigation 9** **Part 1-3** How have humans affected your ecoscenario, and what	**Investigation 9** **Part 1-3** Choose the best solution for the ecoscenario.

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.	efforts have humans made to lessen this impact?	What is the best solution for your ecoscenario disaster?