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To the

Utah 2018 Science with Engineering Education Standards (SEEd) Grade 6

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To the
Utah SEEd Standards for Grade 6

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6.1 Structure and Motion Within the Solar System The solar system consists of the Sun, planets, and other objects within Sun's gravitational influence. Gravity is the force of attraction between masses. The Sun-Earth-Moon system provides an opportunity to study interactions between objects in the solar system that influence phenomena observed from Earth. Scientists use data from many sources to determine the scale and properties of objects in our solar system.	
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.	**SE/TE:** **Earth's Place in the Universe** Design It!: Develop Models, 18 Lunar Motion, Figure 2, 28 Moon Phases, Figure 3, 29 Model It!: Solar and Lunar Eclipses, 31 Topic Review and Assess, 36-37 uDemonstrate Lab: Modeling Lunar Phases, 40-43 **Realize™ Digital Resources:** **Earth's Place in the Universe: Earth-Sun-Moon System** >Lesson 2>Interactivity: Patterns and Earth's Rotations in Space; >Interactivity: What Keeps Objects in Motion?; >Video: Earth's Movement in Space >Lesson 3>Worksheet: Eclipses;>Video: Phases and Eclipses;>uInvestigate Lab: How Does the Moon Move?

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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.	**SE/TE:** **Earth's Place in the Universe** Math Toolbox: Gravity vs. Distance, 22 Orbital Motion, 23 Evidence-Based Assessment, 94-95 **Realize™ Digital Resources:** **Earth's Place in the Universe:** **Earth-Sun-Moon System** >Lesson 1>uInvestigate Lab: Watching the Skies >Lesson 2>Interactivity: Patterns in Earth's rotation in Space; >Interactivity: What Keeps Objects in Motion? **Solar System and the Universe** >Lesson 1>Interactivity: Solar System; >Interactivity: How to Make a Solar System
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.	**SE/TE:** **Cycles Influencing Weather and Climate** Math Toolbox: Temperature and Altitude, 106 **Earth Systems** Evidence-Based Assessment, 144-145 **Earth's Place in the Universe** Math Toolbox: Converting Units of Distance, 50 Hands-On Lab, 53 The Solar System: Figure 7, Describe Patterns, 56-57 Case Study: Comparing Solar System Objects, 60-61 **Realize™ Digital Resources:** **Earth's Place in the Universe: Solar System and the Universe** > Lesson 1>Interactivity: Distance Learning; >Virtual Lab: A New Home; >Interactivity: Solar System; >Video: Distances in the Solar System; >Interactivity: How to Make a Solar System>uInvestigate Lab: Layers of the Sun >Lesson 2>Interactivity: Space Exploration

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6.2 Energy Affects Matter Matter and energy are fundamental components of the universe. Matter is anything that has mass and takes up space. Transfer of energy creates change in matter. Changes between general states of matter can occur through the transfer of energy. Density describes how closely matter is packed together. Substances with a higher density have more matter in a given space than substances with a lower density. Changes in heat energy can alter the density of a material. Insulators resist the transfer of heat energy, while conductors easily transfer heat energy. These differences in energy flow can be used to design products to meet the needs of society.	
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).	**SE/TE:** **Structure and Properties of Matter** Model It!: Molecules and Atoms, 9 Hands-On Lab: uInvestigate, 9 Evidence-Based Assessment, 36-37 **Atoms and Chemical Reactions** Model It!: Models of an Atom, 9 Lesson 1 Check, #5-Develop Models, 13 Review and Assess, #5, Develop Models, 56 Model It!: Formation of Ammonia, 92 **Changing Earth and Human Activity** Model It!: Ozone Model, 119 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 1>uInvestigate Lab: Modeling Atoms and Molecules;>Interactivity: Molecules and Extended Structures **Atoms and Chemical Reactions: Atoms and the Periodic Table** > Lesson1>Interactivity: Build an Atom; >Interactivity: Models of Atoms

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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).	**SE/TE:** **Structure and Properties of Matter** Model It!: Dry Ice, 63 Model It!: Developing Models, 71 How Pistons Work, 74 Topic Review and Assess, 11#, 79 Evidence-Based Assessment, 80-81 uDemonstrate Lab: Melting Ice, 82-85 **Energy Transfer** Model It!: Develop Models, 58 **Cycles Influencing Weather and Climate** Model It!: Altitude and Air Density, 7 **Realize™ Digital Resources:** **Structure and Properties of Matter: Introduction to Matter** >Lesson 2>Interactivity: Calculating Density **Solids, Liquids, and Gases** >Lesson 1>uInvestigate Lab: Properties of Matter >Lesson 2>Interactivity: Particle Motion and States of Matter;>Interactivity: States of Matter; >uInvestigate: Mirror, Mirror >Lesson 3> Video: Gas Behavior; >Interactivity: Hot Air Balloon Rode

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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.	**SE/TE:** **Structure and Properties of Matter** uDemonstrate Lab: Melting Ice, 82-85 **SE/TE:** **Energy Transfer** uDemonstrate Lab: Testing Thermal Conductivity, 84-87 **Realize™ Digital Resources:** **Structure and Properties of Matter: Solids, Liquids, and Gases** >Lesson 1> Virtual Lab: Cooking and States of Matter >Lesson 2> Thermal Energy and Changes of State; >uInvestigate: Mirror, Mirror **Energy Transfer: Thermal Energy** >Lesson 3>uInvestigate Lab: Comparing How Liquids Cool
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.	**SE/TE:** **Energy Transfer** Quest Kickoff: How can you keep hot water from cooling down?, 52-53 uEngineer It!: Shockwave to the Future, 69 uDemonstrate Lab: Testing Thermal Conductivity, 84-87 **Structure and Properties of Matter** uEngineer It!: From "Ink" to Objects: 3D Printing, 55 **Realize™ Digital Resources:** **Energy Transfer: Thermal Energy** >Lesson 2>Interactivity: Solar Oven Design >Lesson 3>Quest Check-In Lab: Keep the Heat In; Keep the Cold Out >Topic Close>Quest Findings>Reflect on Your Insulating Container

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6.3 Earth's Weather Patterns and Climate All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. Heat energy from the Sun, transmitted by radiation, is the primary source of energy that affects Earth's weather and drives the water cycle. Uneven heating across Earth's surface causes changes in density, which result in convection currents in water and air, creating patterns of atmospheric and oceanic circulation that determine regional and global climates.	
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.	**SE/TE:** **Cycles Influencing Weather and Climate** Model It!: Identify Patterns, 19 Lesson 2 Check, Use Models, 20 Quest Check-In, 20 uEngineer It!: Catching Water With a Net, 21 uDemonstrate Lab: Water from Trees, 54-57 **Earth Systems** Model It!: Sea Ice and Climate, 8 Topic Review and Assess, 17#, Develop Models, 37 **Realize™ Digital Resources:** **Cycles Influencing Weather and Climate: Weather in the Atmosphere** >Lesson 2>Inquiry Warm-Up Lab: Water in the Air;>uInvestigate Lab: How Clouds and Fog Form >Lesson 3>Quest Check-In Interactivity: All About Air Masses **Realize™ Digital Resources:** **Earth Systems: Introduction to Earth's Systems** >Lesson 3>Interactivity: The Water Cycle

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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.	**SE/TE:** **Cycles Influencing Weather and Climate** Quest Kickoff: How can you prepare for severe weather?, 2-3 Connect It!, 22 Major Air Masses, 23-24 Types of Fronts, 25-27 Model It!: Develop Models, 27 Lesson 3 Check, 29 Quest Check-In, 29 Global Patterns and Local Weather, 33 Math Toolbox: Isobars, 34 Weather Maps, 35 Evidence-Based Assessment, 52-53 **Realize™ Digital Resources:** **Cycles Influencing Weather and Climate** **Weather in the Atmosphere** >Lesson 3>Interactivity: When Air Masses Collide;>uInvestigate Lab: Weather Fronts; >Interactivity: Mapping Out the Weather; >Quest Check-In Interactivity: All About Air Masses;>Enrichment: Occluded Fronts

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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 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.	**SE/TE:** **Cycles Influencing Weather and Climate** Math Toolbox: Isobars, 34 Lesson 4 Check, #2, Patterns, 36 Model It!, 41 Model It!, 76 Global Wind Belts: Interpret Diagrams, 78 Hand-On Lab: uInvestigate, 84 Surface Currents, Figure 2, 84 Topic Review and Assess, 92-93 Evidence-Based Assessment, 94-95 uDemonstrate Lab: Not All Heating Is Equal, 96-99 Major Ocean Currents, 107 **Realize™ Digital Resources:** **Cycles Influencing Weather and Climate: Energy in the Atmosphere and Ocean** >Lesson 2>Inquiry Warm-Up Lab: Turn, Turn, Turn;>Interactivity, Where the Wind Blows; >Video: Patterns of Circulation in the Atmosphere;>uInvestigate Lab: United States Precipitation;>Interactivity: Winds Across the Globe

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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.	**SE/TE:** **Cycles Influencing Weather and Climate** Connect It!, 4 Earth's Insulator, 5 Literacy Connection: Support Author's Claim, 9 Lesson 1 Check, 11 Review and Assess, #2, 50 Make Meaning, 66 Lesson 1 Check, 70 Topic Review and Assess, 92-93 Reflect, 115 **Realize™ Digital Resources:** **Cycles Influencing Weather and Climate: Energy in the Atmosphere and Ocean** >Lesson 1>uInvestigate Lab: Heating Earth's Surface;>Enrichment: Energy in the Atmosphere

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6.4 Stability and Change in Ecosystems The study of ecosystems includes the interaction of organisms with each other and with the physical environment. Consistent interactions occur within and between species in various ecosystems as organisms obtain resources, change the environment, and are affected by the environment. This influences the flow of energy through an ecosystem, resulting in system variations. Additionally, ecosystems benefit humans through processes and resources, such as the production of food, water and air purification, and recreation opportunities. Scientists and engineers investigate interactions among organisms and evaluate design solutions to preserve biodiversity and ecosystem resources.	
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.	**SE/TE:** **Relationships Within Ecosystems** Math Toolbox: Graphing Population Changes, 40 Case Study: The Case of the Disappearing Cerulean Warbler, 44-45 Math Toolbox: Predator-Prey Interactions, 83 Lesson 1 Check, 87 Factors Affecting Biodiversity, 100-101 Question It!, 101 Math Toolbox, Room to Roam, 102 Evidence-Based Assessment, 122-123 uDemonstrate Lab: Changes in an Ecosystem, 124-127 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 1>Interactivity: An Ecological Mystery; >uInvestigate Lab: Elbow Room **Populations, Communities, and Ecosystems** >Lesson 3>Interactivity: Biodiversity in the Amazon

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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.	**SE/TE:** **Relationships Within Ecosystems** Symbiotic Relationships, 84-86 Lesson 1 Check, 87 Case Study: The Dependable Elephant, 108-109 Topic Review and Assess, 120-121 uDemonstrate Lab: Changes in an Ecosystem, 124-127 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 1>Interactivity: Symbiotic Relationships; >Interactivity: Life on the Reef;>uInvestigate Lab: Competition and Predation;>Enrichment: Analyzing Predator-Prey Interactions

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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. Examples could include Utah ecosystems such as mountains, Great Salt Lake, wetlands, and deserts.	**SE/TE:** **Relationships Within Ecosystems** Food Webs, 50 Model It!: Food Web, 51 Energy Pyramids, 52 Math Toolbox, 53 Lesson Check, #1, 54 Water Cycle, 58-59 Carbon and Oxygen Cycle, 60 Nitrogen Cycle in Ecosystems, 62-63 Topic Review and Assess, 66-67 Evidence-Based Assessment, 68-69 uDemonstrate Lab: Last Remains, 70-73 Supporting Services, Figure 3, 114 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Ecosystems** >Lesson 2>Interactivity: Energy Roles and Flows; >Interactivity: Living Systems; Living Things in Ecosystems;>uInvestigate Lab: Observing Decomposition;>Quest Check-In Interactivity: Nutrients and Aquatic Organisms >Lesson 3>Interactivity: Cycles of Matter; >uInvestigate Lab: Following Water

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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.	**SE/TE:** **Relationships Within Ecosystems** Succession, 89-91 Ecosystem Disruptions and Population Survival, 92-93 Lesson 2 Check, 94 Evidence-Based Assessment, 122-123 uDemonstrate Lab: Changes in an Ecosystem, 124-127 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 2>Interactivity: Succession in an Ecosystem;> Interactivity: A Butterfly Mystery
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.	**SE/TE:** **Relationships Within Ecosystems** Quest Kickoff: Should an Animal Crossing Be Constructed in My Community?, 76-77 Human Impact, 103-106 Design It!: Ecological Restoration, 117 uEngineer It!: From Bulldozers to Biomes, 119 **Realize™ Digital Resources:** **Relationships Within Ecosystems: Populations, Communities, and Ecosystems** >Lesson 4>Interactivity: Preventing Soil Erosion;>Worksheet: Preventing Soil Erosion >Topic Close>Quest Findings: Reflect on Your Animal Crossing

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