

YEAR AT A GLANCE
Student Learning Outcomes by Unit
2016-2017

SCIENCE
 GRADE LEVEL 8

UNIT: Planetary Science		Overarching/general themes:					
Dates:	Structures and motions of objects in the Solar System, Earth and Moon; day and night; models and representations						
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3 sessions, 3 days	Investigation 1 Where Am I?	<ul style="list-style-type: none"> Observe the schoolyard and draw a map to represent the area. Describe the use of a map in terms of models. (ES-1) Interpret representations of human-made and natural structures in aerial photographs. Document observations in a notebook. (ES-1) Relate information from different frames of reference. Write a statement that explains two reference frames. 					
2 sessions, 2 days	Investigation 2 Round Earth/Flat Earth	<ul style="list-style-type: none"> Write a statement that explains longitude and latitude. Use models and simulations to make observations, gather evidence, and draw conclusions about the shape of Earth. (TE-2.2) Make shadow observations, collect and organize information, graph shadow data, and describe and explain the resulting relationship about the length of shadows and places on Earth. Write a claim and support it with logical reasoning and relevant evidence, using accurate, credible sources (class observations and readings) to demonstrate an understanding of the shape of the Earth and the relationship CWA: <i>Is the Earth Flat Or Round</i> 					
4-5 sessions, 1 week	Investigation 3 Day and Night	<ul style="list-style-type: none"> Explore the celestial geometry and motions that produce day and night. Gather relevant information from multiple print and digital sources, and investigations to write an explanation of how day and night occurs. (ES-8, PS-11) Use models to relate Earth's motions to the Sun. Write an analysis of the strengths and weaknesses of the models. (ES-8, ES-9, PS-11) Communicate how to determine the direction of Earth's rotation, using precise and science-specific language. (ES-8) Use astronomical data to determine local noon. Investigate the convention of time zones with maps and globes. Write an explanation of time zones. 					
4 sessions, 1 week	Investigation 4 Discover the Moon	<ul style="list-style-type: none"> Observe and record the Moon's appearance and time of day/night it is observed for a month. Document changes over time in a notebook. (ES-9) Observe photos of the Moon, describe major surface features, and compare and contrast it to the Earth. Create a list of questions to investigate; conduct a brief research project, drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (ES-10) Relate the origin of features of the Moon through a myth. 					
7 sessions, 1.5 weeks	Investigation 5 Moon Craters	<ul style="list-style-type: none"> Design and conduct experiments to relate impact variables to resulting landforms. (ES-8, TE-2.1) Relate evidence and understanding of processes to construct explanations about the lunar surface, using evidence from class activities and informational texts; e.g., make a claim about the sequence of a set of impact craters. Provide evidence and reasoning in support of the claim. (ES-8, PS-5) Close Reading: FOSS Student Resource Book, <i>The Crater That Ended The Reign of The Dinosaurs</i> 					

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3 sessions, 3 days	Investigation 6 Mapping the Moon	<ul style="list-style-type: none"> • Interpret lunar features on photographs and determine size relationships using mathematics. • Write a description of a sequence of events that explains the formation of lunar maria. • Draw accurately scaled Moon craters. Use mathematics (scale and ratio) to understand relative sizes.
5-6 sessions, 1+ week	Investigation 7 Landing on the Moon	<ul style="list-style-type: none"> • Construct a scale model of the Earth/Moon system. (ES-9, ES-10) • Describe the sequence and timing of events that will result in a successful Moon mission. (ES-10, TE-6.1, TE-6.2) • Compare and describe day and night on Earth and the Moon. Write an explanation in notebook. (ES-10, PS-11)
4-5 sessions, 1 week	Investigation 8 Moon Rocks	<ul style="list-style-type: none"> • Observe, measure, and organize the properties of lunar rocks. (PS-2, PS-8) • Establish and apply criteria for rock sampling and analysis. • Relate the density of minerals to the formation of the Moon. (PS-2, PS-8) • Use inferential thinking to compare theories of the origin of the Moon. Draw evidence from text and use it develop ideas, assessing whether the reasoning is sound and the evidence is relevant and sufficient. (ES-8)
4 sessions, 1 week	Investigation 9 Phases of the Moon	<ul style="list-style-type: none"> • Use models and simulations to explore the mechanics of Moon phases and eclipses; write an explanation. (ES-9) • Use inferential thinking to predict the positions and motions of the dynamic Sun/Earth/Moon system that account for the day, year, seasons, and phases of the Moon. Write a statement that supports predictions with evidence and reasoning. (ES-9)
5-6 sessions, 1+ week	Investigation 10 Explore the Planets	<ul style="list-style-type: none"> • Earth and the Solar System are a set of closely coupled systems. Write an explanation about how these systems interact. (ES-8, ES-10, ES-12) • Gather relevant information from multiple sources, assess the credibility/accuracy, and quote or paraphrase the data and conclusions to avoid plagiarism, and follow a standard format for citation.

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UNIT: Populations and Ecosystems Dates:	Overarching/general themes: Populations, ecosystems, biotic/abiotic; photosynthesis; food chains/webs; energy flow in systems; genetics; inheritance; natural selection				
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3-4 Sessions, 1 week	Investigation 1 Milkweed Bugs	<ul style="list-style-type: none"> • Observe milkweed-bug individuals and populations to monitor changes. Record data in notebooks. (LS-13) • Describe and communicate a sequence of events during a long-term study. 			
2-3 Sessions, 2-3 days	Investigation 2 Sorting Out Life	<ul style="list-style-type: none"> • Analyze and sort images on cards to determine which represent individuals, populations, communities, and ecosystems. • Identify biotic and abiotic elements in an ecosystem. • Relate the characteristics of a population, community, and ecosystem. Differentiate among them. 			
3+ Sessions, 3 days	Investigation 3 Mini-ecosystems	<ul style="list-style-type: none"> • Research/read informational text about organisms to construct a classroom ecosystem. • Observe, describe, and record changes to an ecosystem, using a scientific log. • Describe the relationships among biotic and abiotic factors. Provide examples of how they interact in an ecosystem. (LS-13) 			
3 Sessions, 3 days	Investigation 4 Mono Lake	<ul style="list-style-type: none"> • Research the functional roles of organisms in an ecosystem. (LS-13) • Use data to construct feeding relationships, diagramming and explaining food chains and food webs in notebooks. (LS-14) (LS-15) 			
7 Sessions, 1.5 weeks	Investigation 5 Finding the Energy	<ul style="list-style-type: none"> • Investigate and measure the amount of energy from a food source. Use mathematical calculations to determine results. • Use a model to determine the mass of production needed to support primary, secondary, and third-level consumers. • Relate photosynthesis to food and food webs to trophic levels. Write an explanation and illustrate as needed. (LS-16) • Infer how energy moves through an ecosystem. Write a narrative to show energy flow through an ecosystem, providing descriptive details and well-structured event sequences, as well as precise language and scientific vocabulary. (LS-14) 			
5-6 Sessions, 1+ week	Investigation 6 Population Size	<ul style="list-style-type: none"> • Use a model to better understand population growth. Calculate theoretical growth of a milkweed-bug population with no limits. • Analyze results of experiments on abiotic factors and bug egg hatching. • Relate abiotic and biotic factors to the growth or decline of populations. (LS-17) • Write an argument, support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrate an understanding of population growth of milkweed bugs. 			
5 Sessions, 1 week	Investigation 7 Ecoscenarios	<ul style="list-style-type: none"> • Conduct a short research project that describes and communicates the abiotic and biotic components and their interrelations in a specific area. (LS-13) (LS-14) • Apply understanding of ecological concepts to a new system. • Write a statement that describes ways that different ecosystems are similar and different. • Close Reading: FOSS Student Resource Book, <i>Biosphere 2</i> 			

7 Sessions, 1.5 weeks	Investigation 8 Adaptations	<ul style="list-style-type: none"> • Investigate the adaptive value of protective coloration. Explain how protective coloration affects populations. (LS-10) • Explain how adaptations help organisms survive in a specific environment. (LS-12) • Describe how a population can change over time in response to environmental factors. (LS-10) (LS-13)
6 Sessions, 1+ week	Investigation 9 Genetic Variation	<ul style="list-style-type: none"> • Use a simulation to determine the transfer of genetic information during breeding and the traits that result. Track results in data tables and explanations in notebooks. (LS-7) (LS-8) • Explain how organisms inherit traits from parents. Describe the interaction of dominant and recessive alleles. (LS-7) (LS-8) • Predict the proportion of offspring (by using Punnett squares) that will have certain traits. Use evidence and reasoning to support them. (LS-7) • Show conceptual understanding through the careful use of precise language and genetics/inheritance vocabulary. • CWA: How will the Peppered Moths Change?
5 Sessions, 1 week	Investigation 10 Natural Selection	<ul style="list-style-type: none"> • Describe how selective pressure can affect the genetic makeup of a population. (LS-10) (LS-11) (LS-12) • Explain how the traits expressed by the members of a population can change naturally over time. Provide examples to clarify ideas. (LS-10)

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5-6 Sessions, 1+ week	Investigation 1 Substances	<ul style="list-style-type: none"> • Use domain specific vocabulary to communicate understanding, e.g., substance, physical & chemical changes, reactions. • Observe and compare reactions while they occur and the residues left behind. (PS-10) • Explain that a reaction changes initial substances into new, different substances. Write a statement contrasting physical and chemical changes. (PS-10) • Determine the identity of an unknown mixture of substances through experimentation. Record data in tables. Use as evidence to justify a claim. (PS-8) • CWA: Is it a chemical change? 			
4 Sessions, 1 week	Investigation 2 Elements	<ul style="list-style-type: none"> • Use information in the periodic table to analyze substances in terms of their elemental composition. (PS-5) • Explain that all common matter is made of elements, using examples to clarify. 			
5 Sessions, 1 week	Investigation 3 Particles	<ul style="list-style-type: none"> • Use standardized procedures to determine the volume of gas produced in a reaction. • Explain the effects of pressure on gases, using data/observations gathered using syringes and showing cause and effect. (PS-15) • Explain the composition of gas in terms of individual particles in constant motion. (PS-15) • Use drawings and words to explain gas compression and expansion. • Use domain specific vocabulary to communicate understanding, e.g., matter, particle, gas, compression, expansion, force. 			
4-5 Sessions, 1 week	Investigation 4 Kinetic Energy	<ul style="list-style-type: none"> • Heat and cool gas, liquid, and solid matter to observe expansion and contraction. Diagram and explain observations. • Explain kinetic energy and how heating and cooling affect it. (PS-13) • Discuss expansion and contraction in terms of kinetic energy by explaining how a thermometer works. (PS-15) • Close Reading: FOSS Student Resource Book, <i>Particles In Motion</i> 			
6 Sessions, 1+ week	Investigation 5 Energy Transfer	<ul style="list-style-type: none"> • Observe and describe energy transfer using hot and cold water (collision, conduction). (ES-3) • Record data from food lab and calculate energy transfer in calories as a measurement of heat. • Explain energy transfer in terms of change of particle kinetic energy resulting from collision. (PS-13) 			
2 Sessions, 2 days	Investigation 6 (Optional) Heat of Fusion	<ul style="list-style-type: none"> • Experiment with hot water, ice, and ice water to discover heat of fusion. Calculate heat of fusion from data. • Explain the apparent discrepancy in energy transfer when hot water melts ice. (ES-3) • Explain that heat of fusion is energy that melts ice without changing the kinetic energy of particles. 			
7-8 Sessions, 1.5 weeks	Investigation 7 Phase Change	<ul style="list-style-type: none"> • Investigate the transfer heat to and from substances to observe phase change. Write an explanation based on observations. (PS-10) • Explain phase and phase changes in terms of the relationships of particles to one another in a substance. Use 			

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		illustrations for clarity. <ul style="list-style-type: none"> • Discuss phase change in terms of kinetic energy and energy transfer. (PS-13) • Use domain specific vocabulary to communicate understanding, e.g., phases/states of matter; phase change processes - evaporation, condensation, melting, freezing, sublimation, and deposition; heat transfer; energy transfer; kinetic energy. 			
6 Sessions, 1+ week	Investigation 8 Solutions	<ul style="list-style-type: none"> • Use balances to compare densities of solutions and record observations. Use this information to infer concentration. • Explain the process of dissolving – that it occurs when one substance (solute) is reduced to particles and is distributed uniformly throughout the particles of a second substance (solvent); and includes both kinetic interactions (collisions) and attractive forces (bonds). (PS-8) • Discuss concentration as the ratio of solute particles to solvent particles. • Describe how to find the amount of solute needed to saturate a volume of solvent. • Describe the characteristics of a solution at the particle level. Use drawings, as needed, for clarity. (PS-15) 			
7 Sessions, 1.5 weeks	Investigation 9 Reaction	<ul style="list-style-type: none"> • Use chemical formulas and balanced chemical equations to represent chemical reactions. • Conduct a neutralization reaction to determine the effectiveness of an antacid. • Explain chemical reaction as a process in which atoms rearrange to form new substances. (PS-10) • Use domain specific vocabulary to communicate understanding, e.g., atoms, elements, molecules, ionic compounds, attractive forces, bonds, chemical reactions, reactants/products, chemical formulas. 			
5 Sessions, 1 week	Investigation 10 More Reactions	<ul style="list-style-type: none"> • Measure the volume of gas produced in a reaction to infer the concentrations of reactants. Explain how the quantities of reactants affect the quantities of products. (PS-4) • Use water displacement to determine the volume of oxygen consumed during the oxidation of iron. • Describe the reaction in terms of limiting factors and excesses. 			