Appendix

Connections to the *Next Generation Science Standards* and the *Common Core State Standards*

Chapter 4

Standard
MS-ESS1. Earth's Place in the Universe (*www.nextgenscience.org/msess1-earth-place-universe*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic timescale is used to organize Earth's 4.6-billion-year-old history.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Engaging in Argument From Evidence	• Students design and carry out an experiment to see how speed affects distance between footprints. • Students use data from their own experiment, along with data from a variety of animals, to support their claim. • Students make a claim about how stride length is affected by speed and support it with evidence. • Students read about a claim made by a paleontologist and analyze the evidence he provides for that claim. • In the thinking visually section, students identify the assumptions made by the researchers in using modern animals as models for dinosaurs.
Disciplinary core ideas	**ESS1.C.** The History of Planet Earth • The geologic timescale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.	• Although this chapter deals indirectly with this core idea, it provides an important foundation for learning about geologic timescales, namely that "the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future"(NGSS Lead States, p. 68; constructing an explanation).
Crosscutting concepts	• Patterns • Stability and Change	• Students look for patterns in speed versus stride length in their own data and data from a variety of other animals. • Students construct an argument and then analyze an argument made by practicing scientists based on the idea that some processes remain stable across geologic time.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.1.** Cite specific textual evidence to support analysis of science and technical texts. • **CCSS.ELA-Literacy.RST.6-8.2** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. • **CCSS.ELA-Literacy.RST.6-8.5.** Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. • **CCSS.ELA-Literacy.RST.6-8.6.** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.	• *Reading strategies:* Comprehension coding and reading in groups (both of which require citing specific chunks of text) • Comprehension coding requires students to note when their prior knowledge conflicts with what the text says. • Students outline the argument made by a practicing scientist about the purpose of a dinosaur's skull structure and analyze its effectiveness.
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.1.** Write arguments focused on discipline-specific content.	• Students write an argument with a claim and evidence for their interpretation of a dinosaur trackway.

Chapter 5

Standard
MS-ESS2. Earth's Systems (*www.nextgenscience.org/msess2-earth-systems*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Developing and Using Models • Constructing Explanations and Designing Solutions	• Students use a model of a mountain to examine causes and effects of erosion. • Students use provided materials to explore possible solutions to an erosion problem.
Disciplinary core ideas	**ESS2.C.** The Roles of Water in Earth's Surface Processes • Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.	• Students observe and read about the ways water and gravity drive erosion and deposition activity on Earth.
Crosscutting concepts	• Cause and Effect • Stability and Change	• Students experiment with causes and effects of erosion using a model. • Students observe and read about how erosion changes the Earth, and how humans attempt to create stability.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics. • **CCSS.ELA-Literacy.RST.6-8.9.** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	• *Reading strategy:* Finding the meaning of new words • The Big Question in this chapter requires students to compare their lab results to their reading and use new words from the reading to describe what happened in lab.
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	• *Writing prompt:* Digger Johnson has just gotten a contract to build a road into the side of a mountain. He doesn't know a thing about erosion. Write Mr. Johnson a letter explaining how erosion could affect his road. Give him some suggestions for protecting it.

Chapter 6

Standard
MS-ESS2. Earth's Systems (*www.nextgenscience.org/msess2-earth-systems*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed the Earth's surface at varying time and spatial scales.
MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Analyzing and Interpreting Data • Engaging in Argument From Evidence	• At three stations, students analyze evidence from mountain ranges, glaciation, and fossils that Wegener used to propose his theory of moving continents. • Students make and support a claim as to whether torn paper originated from the same advertisement. • Students read about how scientists received Wegener's claims about continental drift. • *Writing prompt*: Imagine that you could go back in time and talk to the geologists at the conference where they mocked Wegener's idea. Explain to them how new evidence from the ocean and satellites supports the idea that continents can move.
Disciplinary core ideas	**ESS1.C.** The History of Planet Earth • Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. **ESS2.B.** Plate Tectonics and Large-Scale System Interactions • Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.	• In the thinking visually section, students analyze a diagram of sea floor spreading. • At three stations, students examine evidence from mountain ranges, glaciation, and fossils that Wegener used to propose his theory of moving continents. They read an article about Wegener's claims and how our understanding of plate tectonics has changed over time.
Crosscutting concepts	• Cause and Effect	• Students look at data on the effects of plate tectonics, and then read about the process scientists used to determine cause.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.2.** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. • **CCSS.ELA-Literacy.RST.6-8.7.** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	• *Reading strategy*: Chunking • Chunking requires focusing on the text in small bits to ensure that each piece is understood. • Students study diagrams at stations before reading; additional diagrams are provided in the text.
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.1.** Write arguments focused on discipline-specific content. • **CCSS.ELA-Literacy.WHST.6-8.2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	• *Writing prompt:* Imagine that you could go back in time and talk to the geologists at the conference where they mocked Wegener's idea. Explain to them how new evidence from the ocean and satellites supports the idea that continents can move. • *The Big Question:* Do scientists ever change their minds about how something on Earth works? What helped scientists eventually accept Wegener's claim?

Chapter 7

Standard
MS-ESS2. Earth's Systems (*www.nextgenscience.org/msess2-earth-systems*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Developing and Using Models • Constructing Explanations and Designing Solutions	• Students model the formation of a landform in which sea life fossils end up on the top of a mountain. • Using information from their model, students respond to the following: Imagine you are hiking this mountain with your friend and see one of the colored shells. She asks, "How did a fossil shell get on top of a mountain?" What do you tell her?
Disciplinary core ideas	**ESS1.C.** The History of Planet Earth • The geologic timescale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.	• Students read an article on how scientists date landforms (with specifics from the Burgess Shale). They use the information to respond to the following prompt: Write a paragraph that explains the difference between an absolute age and a relative age. Give an example of each from geology, and then give an example of how you could describe how long you've been alive using a relative age and an absolute age.
Crosscutting concepts	• Systems and System Models • Patterns	• Students use a model to explore changes to a landform over a large area and through a long period of time. • In thinking visually, students interpret patterns in rock formations and see how those patterns can indicate the history of those rocks.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.	• *Reading Strategy:* Finding the meaning of new words
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. • **CCSS.ELA-Literacy.WHST.6-8.2.c.** Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.	• Write a paragraph that explains the difference between an absolute age and a relative age. Give an example of each from geology, and then give an example of how you could describe how long you've been alive using a relative age and an absolute age. • *Prewriting questions:* What science words will you need? What writing words could you use? (comparison and contrast words such as *similarly, in contrast, however,* etc.).

Chapter 8

Standard **MS-ESS2.** Earth's Systems (*www.nextgenscience.org/msess2-earth-systems*)		
Performance expectations The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below. **MS-ESS2-1.** Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.		
Dimension	**Element**	**Matching Student Task or Question From the Activity**
Science and engineering practices	• Engaging in Argument From Evidence	• Students make an argument for which location police should search for the stolen goods, based on evidence from rock samples.
Disciplinary core ideas	**ESS2.A.** Earth's Materials and Systems • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the Sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.	• Students observe several types of rocks and read about rock types and how they can influence a police investigation.
Crosscutting Concepts	• Energy and Matter: Flows, Cycles, and Conservation	• In the thinking visually section, students answer questions about the cycling of matter through rocks.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.1.** Cite specific textual evidence to support analysis of science and technical texts. • **CCSS.ELA-Literacy.RST.6-8.9.** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	• *Reading strategy:* Chunking • Chunking involves close reading of dense text in order to understand each idea presented.
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.1.** Write arguments focused on discipline-specific content. • **CCSS.ELA-Literacy.WHST.6-8.1.a.** Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.	• Students write an argument for which location police should search for the stolen goods, based on evidence from rock samples. • *Extension:* If your students are accustomed to writing about claims and evidence, help them include counterclaims in their response with this demonstration.

Chapter 9

Standards
MS-ESS2. Earth's Systems (*www.nextgenscience.org/msess2-earth-systems*)
MS-ESS3. Earth and Human Activity (*www.nextgenscience.org/msess3-earth-human-activity*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

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.
MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Developing and Using Models	• Students use a model to look at the effect of water use on groundwater storage.
Disciplinary core ideas	**ESS2.A.** Earth's Materials and Systems • All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the Sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. **ESS2.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. • Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.	• Students observe formation of groundwater on a model and then read about the water cycle, and how the depletion of groundwater leads to sinkholes. • Students explain how water, combined with limestone's chemical properties, leads to karst formations. Additionally, students consider how human water consumption affects this system.
Crosscutting concepts	• Cause and Effect • Energy and Matter: Flows, Cycles, and Conservation • Systems and System Models	• Students follow a complicated chain of interactions that begins with rainfall over certain terrain and ends with water consumption and sinkholes. They respond to the following prompt: In your lab, you were asked to guess how limestone and groundwater could be related. Based on the article, describe at least one relationship between limestone and groundwater. • Students use the water cycle to understand sinkholes and see how limited quantities of water affect the karst ecosystem. • Students use models, both physical and in the form of diagrams, to understand the larger system of karst formation, and see how that system interacts with the water cycle.

Chapter 9 *(Continued)*

***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.2.** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. • **CCSS.ELA-Literacy.RST.6-8.9.** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	• *Reading strategy:* Talk your way through it • In this strategy, students practice summarizing the text as they read. • Students use a model and then read about the same topic. They compare the two sources of information to derive conclusions about the effect of the water cycle on karst landscapes.
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	• *Writing prompt:* Late one night in 2011, a UPS store in Georgetown, South Carolina, collapsed into a sinkhole. The store was located over a limestone aquifer that had been stable until the collapse. The owners are suing the South Carolina Department of Transportation because the department had been draining groundwater nearby to allow for the installation of some underground structures. Pretend you are filing a legal brief (report) to support the UPS store's case. Explain how the Department of Transportation's groundwater work might have led to a sinkhole under the UPS store.

Chapter 10

Standard
MS-ESS2. Earth's Systems (*www.nextgenscience.org/msess2-earth-systems*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Developing and Using Models	• Students use physical models to look at factors that affect ocean currents. • Students answer questions about how their physical models represent larger systems. • Students read about how new research is challenging an existing digital model of ocean currents.
Disciplinary core ideas	**ESS2.C.** The Roles of Water in Earth's Surface Processes • The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. • Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.	• Students observe variables (heat and salt) that can affect water density and ocean currents. • Students read about the factors that affect ocean currents and research using floats to observe ocean currents.
Crosscutting concepts	• Systems and System Models	• *Writing prompt:* Scientists often create models to show how they think something works. Do scientists ever change these models? Provide an example from the text to support your answer.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.7.** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	• *Reading strategy:* Previewing diagrams and illustrations • *Writing prompt*: Students are asked to compare the simulation to the text to determine why the water layered as it did.
Writing standard(s)	• **CCSS.ELA-Literacy.RST.6-8.9.** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. • **CCSS.ELA-Literacy.WHST.6-8.2**. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	• *Writing prompt:* Revisit the second model from your lab activity. Using information from the article, explain why the water moved as it did and how this model relates to ocean circulation. Feel free to include diagrams in your explanation. • *Prewriting questions:* Make a quick list of the key ideas you want to include. Number them in the order you will use them. What science words will you want to include? You will be writing about a process that involves cause and effect. What kinds of writing words could help you structure your explanation? (*first, next, then, because, therefore*)

Chapter 11

Standard
MS-ESS2. Earth's Systems (*www.nextgenscience.org/msess2-earth-systems*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Constructing Explanations	• Students use information from observation, from data, and from their reading to explain how wind and currents cause garbage to collect in specific places on Earth.
Disciplinary core ideas	**ESS2.C.** The Roles of Water in Earth's Surface Processes • The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. **ESS3.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 affects (negative and positive) for different living things.	• Students observe how wind affects water by blowing over water with a straw and watching how the water moves and what happens when it encounters landforms. • Students use maps of ocean currents to explain differences in mean temperatures in cities at similar latitudes and elevation. • Students read about how ocean currents and the Coriolis effect concentrate plastic waste in certain areas of the ocean.
Crosscutting concepts	• Scale, Proportion, and Quantity	• Students observe small models of several variables (the Coriolis effect, wind on water, currents on garbage, etc.) Then they read about how these small variables work together over a large scale to affect global garbage distribution.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.1.** Cite specific textual evidence to support analysis of science and technical texts. • **CCSS.ELA-Literacy.RST.6-8.5.** Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.	• *Reading strategy:* Identifying Text Signals for Cause and Effect
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. • **CCSS.ELA-Literacy.WHST.6-8.2.c.** Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.	• *Writing prompt:* Cargo ships sometimes lose all or part of their load during storms at sea. Suppose a ship loaded with rubber duckies spilled its cargo off the coast of Morocco in North Africa. Describe two locations, other than the coast of Africa, where the ducks might end up and tell why they might end up there. • *Prewriting questions*: (1) Help students locate Morocco on a map showing ocean currents. (2) What science terms will you want to include in your writing? (3) You may want to use writing words related to cause and effect. What kinds of writing words would be helpful? (*because, therefore, so,* etc.)

Chapter 12

Standard
MS-ESS2. Earth's Systems (*www.nextgenscience.org/msess2-earth-systems*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Engaging in Argument From Evidence	• *Writing prompt:* Think back to your lab. Why didn't the balloon pop when it was filled with water? Make a claim, support it with evidence, and explain how the evidence supports your claim.
Disciplinary core ideas	**ESS2.D.** Weather and Climate • The ocean exerts a major influence on weather and climate by absorbing energy from the Sun, releasing it over time, and globally redistributing it through ocean currents.	• Students do two activities to observe water's heat capacity. They read about how this heat capacity affects wind and leads to hurricanes.
Crosscutting concepts	• Systems and System Models	• Students read and write about how heat capacity, sunlight, and wind work together to create different weather patterns depending on latitude. • *The Big Question:* How does water's heat capacity cause the wind to blow at the beach?
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.1.** Cite specific textual evidence to support analysis of science and technical texts. • **CCSS.ELA-Literacy.RST.6-8.9.** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	• *Reading strategy:* Identifying text signals for comparisons and contrasts
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.1.** Write arguments focused on discipline-specific content.	• *Writing prompt:* Think back to your lab. Why didn't the balloon pop when it was filled with water? Make a claim, support it with evidence, and explain how the evidence supports your claim.

Chapter 13

Standard
MS.ESS1. Earth's Place in the Universe (*www.nextgenscience.org/msess1-earth-place-universe*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Developing and Using Models • Analyzing and Interpreting Data	• At each station in the exploration, students use models representing size, distance, composition, and satellites of the planets. • Students look for patterns within their data in order to group planets in a data-based manner.
Disciplinary core ideas	**ESS1.B.** Earth and the Solar System • The solar system consists of the Sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the Sun by its gravitational pull on them. • The solar system appears to have formed from a disk of dust and gas, drawn together by gravity.	• Students observe planetary characteristics and compare that information to other data, presenting through reading, which scientists use to group the planets and explain their origins.
Crosscutting concepts	• Patterns • Scale, Proportion, and Quantity • Systems and System Models	• Students analyze data to see patterns that might explain planetary origins. • Students walk through the distance between planets in a model to develop an understanding of the vastness of the universe. They also compare models of the planets to see their relative size. • Students use data to determine why physical models cannot show both distance and size in the solar system accurately.
CCSS Correlations		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.7.** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). • **CCSS.ELA-Literacy.RST.6-8.9.** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	• *Reading strategy:* Previewing diagrams and illustrations • *Pre-reading prompt:* Tell students to watch for information that would explain why the same planets kept ending up in the same groups during their exploration.
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	• In another solar system in our galaxy, scientists have found a planet that is a lot like Jupiter. It is large, not very dense, and mostly made of light gases. However, this gas giant orbits very close to its star. Scientists suspect this gas giant's orbit may have gotten smaller at some point. Assuming this solar system developed the same way that ours did, why would scientists suspect that the planet has moved?

Chapter 14

Standard
MS-ESS1. Earth's Place in the Universe (*www.nextgenscience.org/msess1-Earth-place-universe*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS1-1. Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Developing and Using Models	• Students create a model of the Earth and Sun to explain how differing seasons could take place for two cities at similar latitudes north and south of the equator. • Then students use their model to explain data about light and dark periods and the poles.
Disciplinary core ideas	**ESS1.A.** The Universe and Its Stars • Patterns of the apparent motion of the Sun, the Moon, and stars in the sky can be observed, described, predicted, and explained with models. **ESS1.B.** Earth and the Solar System • This model of the solar system can explain eclipses of the Sun and the Moon. Earth's spin axis is fixed in direction over the short term but tilted relative to its orbit around the Sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.	• Students create a model of the Earth and Sun to explain how differing seasons could take place for two cities at similar latitudes north and south of the equator. • Students use a flashlight and graph paper to determine the difference in energy input for direct and indirect sunlight.
Crosscutting concepts	• Systems and System Models	• Students develop a model to fit one set of data (the seasons in two cities) and then use that model to explain extended patterns of light and dark at the North Pole. • Students read about how the same model explains seasons on other planets, such as Uranus.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.7.** Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	• *Reading Strategy*: Previewing diagrams and illustrations
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.1.** Write arguments focused on discipline-specific content. • **CCSS.ELA-Literacy.WHST.6-8.1.a.** Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.	• *Writing prompt*: A classmate incorrectly claims that winter is when Earth is farthest away from the Sun in its orbit, and summer happens when Earth is closest to the Sun. Make a correct claim about what causes season, and support it with evidence and reasons from your lab and the article. In your response, provide evidence that rebuts your classmates' claim. • *Prewriting questions*: What is a rebuttal? How can you include a rebuttal when writing about a claim? What kinds of writing words might you use in a rebuttal? (*If … then* statements, *however,* and *therefore* are useful words for rebuttals.)

Chapter 15

Standard
MS-ESS3. Earth and Human Activity (*www.nextgenscience.org/msess3-Earth-human-activity*)

Performance expectations
The materials/lessons/activities outlined in this chapter are just one step toward reaching the performance expectations listed below.

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human effect on the environment.
MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources affect Earth's systems.

Dimension	Element	Matching Student Task or Question From the Activity
Science and engineering practices	• Planning and Carrying Out Investigations • Obtaining, Evaluating, and Communicating Information	• Students design a method and collect data to decide which hair dryer is best. • Students read and evaluate an argument on government policies for energy efficiency.
Disciplinary core ideas	**ESS3.A.** Natural Resources • Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, freshwater, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. **ESS3.C.** Human Impacts on Earth Systems • 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 consider energy efficiency in light of the limits of fossil fuel (and renewable) energy sources. • Students answer questions about a chart that depicts the population and energy use in a variety of countries.
Crosscutting concepts	• Patterns	• Students both generate charts and use charts to organize their evidence and thinking on the topic of energy efficiency.
***CCSS* Correlations**		
Reading standard(s)	• **CCSS.ELA-Literacy.RST.6-8.2.** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions. • **CCSS.ELA-Literacy.RST.6-8.5.** Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic. • **CCSS.ELA-Literacy.RST.6-8.6.** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.	• *Reading strategy:* Evaluating persuasive science writing
Writing standard(s)	• **CCSS.ELA-Literacy.WHST.6-8.9.** Draw evidence from informational texts to support analysis, reflection, and research.	• *Prompt:* What parts of the author's argument in "Mandate Energy Efficiency!" do you accept? Did the author support her position well? Why or why not? What other ideas should she have considered?