Correlation to South Carolina College- and Career-Ready Science Standards 2021

Grade K

South Carolina Performance Expectation	Amplify Science Unit(s) & Specific Activities
K-PS2-1: Motion and Stability: Forces and Interactions Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.	**Pushes and Pulls** Throughout the unit, students investigate the differing strengths of forces — pushes and pulls — on the motion of objects. They compare the effects of different strengths and directions of pushes and pulls through the "Rugball" activity and the "Movement Hunt" activity. Students explore objects in the classroom and how to make them move in Lesson 1.1, and continue that exploration with aHome Investigation. Students conduct investigations in each chapter when they play "Rugball" as well as with their box model of a pinball machine (first introduced in Lesson 1. 2 and developed throughout the unit). They investigate how varying the strength and direction of a push or pull can change the motion of the pinball. Books: *Talking about Forces* offers students an opportunity to develop key scientific language explaining what is happening when a force makes something move. *A Busy Day in Pushville* offers many examples and a chance for students to continually

	practice descriptive words for force motion, pushes, and pulls, and direction of force. *Building with Forces* describes how workers and machinery on a construction site exert forces in different directions in order to put construction materials where they belong. *Forces in Ball Games* shows how forces are exerted in the context of games helps solidify the connection between the physics content that students are learning and the pinball machines they are creating, as well as offering an opportunity to look for changes of direction, stopping and starting motion, and strong and gentle forces.
K-PS2-2: Motion and Stability: Forces and Interactions Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.	**Pushes and Pulls** Throughout the unit, students iteratively design, build, and test solutions to see if they meet their design goals for their pinball machine: to make the pinball start to move, move a short vs. a long distance, move in a specific direction, hit a target, or change direction in different ways. Each time they conduct their tests of specific design solutions, students analyze the result to evaluate whether their design solution works as intended. In Chapter 1, the students are introduced to the Pinball box and the unit-long activity of designing a pinball machine for their classroom that can do all the things a real pinball machine can do. In Lesson 2.1, students specifically explore how far/fast or how strongly/gently they can push an object. In Lesson 3.4, students work to move a ball to a target by manipulating the strength and direction of a force they exert. In Lesson 4.1, students figure out how they can use forces to change a moving pinball's direction by adding moving and still parts to their pinball machines. Throughout the unit, students are also recording and analyzing data in their Student Investigation Notebooks. Books: *Talking about Forces* offers students an opportunity to develop key scientific language explaining what is happening when a force makes something move. (Chapter 1) *Building with Forces* is used as a Shared Reading midway through the unit to help students visualize how forces exerted in different directions make things move in those directions. (Chapter 3) *Room 4 Solves a Problem* describes a class of kindergartners that design solutions using pushes and pulls to give their class pet more exercise. In the book, the students test their

	solutions and analyze the results of each test to determine if their solutions (which involves the pet pushing objects on a track, pushing flaps in a maze, etc.) were effective. The book models the design process that students are using to create their pinball machines in the unit. (Chapter 5) *A Busy Day in Pushville* is used as a Shared Reading at the end of the unit to help students synthesize information and identify evidence of all the different kinds of forces they have learned. *Forces in Ball Games* is the reference book for this unit. Showing how forces are exerted in the context of games helps solidify the connection between the physics content that students are learning and the pinball machines they are creating, as well as offering an opportunity to look for changes of direction, stopping and starting motion, and strong and gentle forces. (Chapter 4)
K-PS3-1: Energy Make observations to determine the effect of sunlight on Earth's surface.	**Sunlight and Weather** In Chapter 2, students expand their investigation to figure out why two fictional playgrounds get warm during the daytime. Throughout the chapter, they develop a deeper understanding of temperature as they learn about sunlight's warming effect on Earth's surface. Constructing an understanding through physical models, students learn that when an object blocks sunlight from reaching Earth's surface, the resulting shaded area has a different temperature than a comparable surface exposed to sunlight. Students have multiple opportunities to observe sunlight's effects on surfaces through models and hands-on investigations conducted outside. They record their observations in their investigation notebooks. Specifically in Lesson 2.1, students use a model of the sun and Earth's surface to investigate why Earth's surface gets warm. Students review the temperature differences between the playgrounds and focus on the question of why both playgrounds start out cold but get warm in the daytime. In Lesson 2.2, students investigate the temperature of areas in sunlight and in shade near their school. In Lesson 2.3, students apply their understanding of the model constructed in Lesson 2.1 to the real world and analyze the effect of sunlight on Earth's surface. In Lesson 2.4, students connect sunlight's warming effects on Earth's surface to weather. Books: *Getting Warm in the Sunlight*, which uses the story of a lizard sunning itself in the desert to illustrate the warming effects of sunlight.

	Cool People in Hot Places takes students to seven locations around the world where people use different techniques to deal with a particular type of severe weather: very high temperatures. This read introduces students to various methods of blocking sunlight, increasing airflow, and using pale colors to prevent surface temperatures from getting too high. These examples help reinforce several essential unit concepts: sunlight warms surfaces, and different surfaces warm at different rates
K-PS3-2: Energy Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.	**Sunlight and Weather** In Lesson 4.1, students gather data from a physical model to determine how a surface's color can impact the surface's temperature. Using conclusions drawn from this model, in Lesson 4.4, students analyze images of proposed solutions intended to regulate temperature on two playgrounds, including changing the surface color and adding shade. They determine that blocking the sun and changing the surface temperature would both be effective for regulating surface temperature. The class then uses a Shared Writing activity to communicate these changes to the principal. Books: *Cool People in Hot Places* takes students to seven locations around the world where people use different techniques to deal with a particular type of severe weather—very high temperatures. The book is a Shared Reading that uses a repetitive structure to introduce students to various methods of blocking sunlight, increasing airflow, and using pale colors to prevent surface temperatures from getting too high. These are all designed solutions to reduce warming effects of sunlight. These examples help reinforce several essential unit concepts: sunlight warms surfaces, different surfaces warm at different rates, weather can become severe, and people can take measures to protect themselves from severe weather. This book helps support students' first hand investigations by showing them real-world examples that relate to the problem they are trying to solve.
K-LS1-1: From Molecules to Organisms: Structures and Processes Use observations to describe patterns of what plants and animals (including humans) need to survive.	**Needs of Plants and Animals** In Lesson 1.4, Student to Student Discussion, students discuss animal needs, then observe photos of different animals eating food to conclude that all animals need food to survive. In Lesson 1.5, Teacher Lead Discussion, students view a series of habitat images and decide which habitats are best suited for particular animals. Then, partners use the reference book, *Handbook of Plants*, and observe habitat stations in the classroom, concluding from the pattern that animals can only live in a place that provides the food they need for survival.

	In Lesson 1.7, students set up an experiment that will provide evidence when it is observed in Chapter 2, Lesson 2.3, Hands-On- that plants need water to survive. Throughout Chapter 3, students conduct an investigation that provides evidence that plants also need light to survive. In Lesson 4.2, students discuss human needs. Students first brainstorm human needs, then gather evidence about human needs from a card set. Students reflect on the pattern of needs for humans and other animals. Books: *Above and Below* describes plants meeting their needs for sunlight and water while animals meet their needs for food and shelter, with cutaway illustrations showing views above ground and underground. *A Plant in the Desert* uses the example of a sage bush to help students understand the needs of plants. This book drives home the idea that all plants and animals need water to survive. Students encounter the book twice as a Shared Reading, each time with a different focus: first, that even plants in the desert need water and second, how plants get that water. *Investigating Monarchs* emphasizes the needs of monarch caterpillars and butterflies. The book first introduces the life cycle of monarchs, explaining that monarch caterpillars must eat milkweed to survive and change into butterflies. Their summer habitat must have milkweed, and their winter habitat must have trees. *Handbook of Plants* includes information about nine different kinds of plants as well as introductory material about plant growth, seeds, leaves getting light, and roots getting water. Students use the book to look up information throughout the unit. The book helps illustrate the concept of habitat, that organisms can only live in a place that has what they need.
K-ESS2-1: Earth's Systems Use and share observations of local weather conditions to describe patterns over time.	**Sunlight and Weather** In Lesson 1.1, students begin to observe different types of weather and develop terms to describe types of weather and weather patterns. In Lesson 1.2, students are introduced to observing weather outdoors and to

	"temperature" as one way to describe local weather. Students collect, record, and analyze local weather data in their investigation notebooks. In Lesson 1.3, using data collected and recorded through observation, students describe local weather and share this information with their peers. In Lesson 1.4, students use data from weather calendars to construct graphs that allow for a comparison. Books: *What Is the Weather Like Today?* tells the story of a girl observing and describing the weather on different days.
K-ESS2-2: Earth's Systems Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.	**Needs of Plants and Animals** In Lesson 3.4, students read *Above and Below*, which includes images of how animals change their environment by digging and building shelter. In Lessons 4.1 and 4.3, students gather evidence about monarch butterflies' needs and make a plan to change a garden to better support monarchs. In Lesson 4.2, students discuss human needs for survival and how meeting those needs affects other living things.
K-ESS3-1: Earth and Human Activity Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.	**Needs of Plants and Animals** Throughout the unit, students consider the needs of monarch butterflies, milkweed plants, and people in the context of a community garden. In Lesson 1.4, students discuss animal needs, then observe photos of different animals eating food to conclude that all animals need food to survive. In Lesson 1.7, students set up an experiment that will provide evidence when it is observed later, in Lesson 2.3 - that plants need water to survive. In Lesson 4.3, students create model gardens that meet both humans' and monarch caterpillars' need for specific foods - vegetables for humans and milkweed plants for monarch caterpillars. This activity is framed in terms of students designing a garden whose harvest can meet the needs of monarch caterpillars and of humans.

	Books: *Handbook of Plants* describes a variety of plants, including plants specialized for surviving in specific habitats such as deserts and rainforests, providing opportunities for comparison.
K-ESS3-2: Earth and Human Activity Ask questions to understand the purpose of weather forecasting to prepare for and respond to severe weather.	**Sunlight and Weather** Lesson 5.1 introduces the topic of severe weather and predicting weather with the book *Tornado! Predicting Severe Weather*. Students identify common and severe weather types and begin a chapter project that has them learning about flooding. Since students have practiced making predictions related to their sunlight models throughout the unit, they are ready at this point to think about how professional weather scientists utilize the skill of predicting to keep people safe. In Lesson 5.2, students begin to explore playgrounds and flooding, asking questions and developing an understanding of how models can help predict outcomes. In Lesson 5.5, students reflect on weather, including severe weather. They make plans, represented visually on Preparation Posters, to keep safe when severe weather threatens. Books: *Tornado! Predicting Severe Weather* tells the story of real-life weather scientist Lynn Burse and how she studies and predicts severe weather. In this Read Aloud, students hear about how Burse and her fellow scientists use their observations and measurements of the weather—including wind, rain, temperature, and changes in weather—to make predictions. This book supports students in making connections between what they are learning in the classroom about predicting and preparing for different weather conditions and what scientists in the field do to help keep people safe. (Chapter 5)
K-ESS3-3: Earth and Human Activity Obtain and communicate information to define problems related to human impact on the local environment.	**Needs of Plants and Animals** The *Needs of Plants and Animals* unit examines the problem of the declining monarch population on a smaller scale. Students assume the role of scientists helping a group of children from the fictional community of Mariposa Grove to explain why there are no more caterpillars in a community garden that was converted from a field which once had caterpillars; students also advise the children on what they can do to bring back the monarchs. In the unit, students figure out that monarch caterpillars feed on milkweed plants, and then investigate what milkweed plants need to grow by observing and recording plants under different water and light conditions. Students also examine the ways that humans change their environment in order to meet their needs and explore how people can choose to share the places they live with other living things. At the end of the unit, students recommend a plan to redesign the garden in Mariposa Grove in such a way that it accommodates the

	needs of both humans and monarchs. In Lesson 1.6, students work to figure out why there are no caterpillars in the garden. In particular, they figure out what monarch caterpillars eat, and determine whether their food (milkweed plants) is growing in the garden. In Lessons 2.7 and 3.4, students work on the Mini-Book that explains the needs of milkweed plants. In Lessons 4.1 and 4.3, students gather evidence about monarch butterflies' needs. They plan changes to the garden and communicate their solution by proposing environmental changes that will improve Milkweed growth and allow monarch caterpillars to live and grow in the area. Books: *Investigating Monarchs* describes how scientists have analyzed the human impact on monarch populations and proposes solutions to address monarch population decline. It describes scientists in Mexico discovering that deforestation impacts the monarch butterfly population by destroying their wintering sites, then advocating for the forests to be protected to preserve this valuable resource. It also describes citizen scientists in the United States surveying milkweed growth and planting more milkweed to provide monarch caterpillars with a habitat that meets their needs.

Grade 1

South Carolina Performance Expectation	Amplify Science Unit(s) & Specific Activities
1-PS4-1: Waves and their Applications in Technologies for Information Transfer Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.	**Light and Sound: Puppet-Theater Engineers** In Lesson 4.1, students are introduced to the challenge of designing sound sources for a puppet show. They plan and conduct investigations as they listen for sounds in the classroom and try to identify their sources. Next, they record evidence of what they hear, see, and feel when different sound sources make sounds. Finally, they identify sound sources in the reference book *Engineering with Light and Sound*.

	In Lesson 4.2 and Lesson 4.3, students read, reread and discuss the book *What Vibrates?*, which explores examples of familiar sounds to convey that all sounds are made by vibrations. In Lesson 4.3, students write mini-books explaining that vibrating materials can make sound. Books: *Engineering with Light and Sound* is used to introduce designing sound solutions for the students' puppet show. *What Vibrates?* Students read and reread this book, focusing on the types of materials that vibrate to make sounds.
1-PS4-1: Waves and their Applications in Technologies for Information Transfer Make observations to support an evidence-based claim that objects in darkness can be seen only when illuminated by light sources.	**Light and Sound: Puppet-Theater Engineers** In Lesson 1.2, students try to make a place as dark as possible, and identify sources of light. Next, students read the book *Can You See in the Dark?*, about a boy who goes on a quest for a truly dark place in order to find out whether he really needs light to see. In Lesson 1.3, the class conducts and debriefs a hunt for light sources around the school.
1-PS4-3: Waves and their Applications in Technologies for Information Transfer Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.	**Light and Sound: Puppet-Theater Engineers** In Lesson 2.1, students use flashlights to explore how to make shadows of different shapes and sizes on surfaces around the classroom. In Lesson 2.2, students read *What Made this Shadow?*, which is a book with pairs of photographs: first just a shadow, then a wider view showing the light source and the object blocking the light. Afterwards, the class discusses the blocking of light as a cause of shadows and makes a physical model of this idea. Next, students sort cards into light sources, light blockers, and shadows. In Lesson 2.3, students plan and conduct an investigation, record data in their Science Notebooks, and compare materials that do or do not block light.

	In Lesson 3.2, students read the book *Let's Test,* which tells the story of two kids who want to create a sun-shelter for their lemonade stand. They try different materials until they find one that blocks just the right amount of sunlight. In Lesson 3.1, students investigate and compare materials that do or do not block light. They record their findings in their notebooks and discuss as a class. In Lesson 3.3, students use the reference book, *Engineering with Light and Sound* to search for solutions that let different amounts of light pass through different materials. Pages 7-25 offer examples of engineers working with light sources and developing devices that transmit or block light to meet specific design criteria.
1-PS4-4: Waves and their Applications in Technologies for Information Transfer Use tools and materials to design and build a device that uses light or sound to communicate over a distance.	**Light and Sound: Puppet-Theater Engineers** Over the course of the unit, students are challenged to create a shadow puppet scene that includes shadows where the light is fully blocked (testing completed in Chapter 2, Lesson 2.4), shadows where the light is partially blocked (testing completed in Chapter 3,Lesson 3.5), and sound sources (testing completed in Lesson 4.4). Using tools and materials, students will build light and sound devices they have designed to produce a puppet show that can be seen and heard throughout the classroom. Also, the reference book *Designing with Light and Sound* includes examples of several devices for communication across a distance, including lighthouses, tornado sirens, and naval signal lamps.
1-LS1-1: From Molecules to Organisms: Structures and Processes Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.	**Animal and Plant Defenses: Spikes, Shells, and Camouflage** In Lesson 2.8, students are introduced to a problem: the aquarium animals' food, which comes in bags and is stored outside, is being eaten by wildlife. Students view images to learn about biomimicry. Students use their knowledge of animal and plant defensive structures, and then brainstorm their ideas and record them in their Science Notebooks. Students then design and build a solution using a variety of materials and select one type of defense to defend the food supply in a way that mimics an animal or plant defense—spikes, spines, or camouflage.

	Books: *Spikes, Spines, and Shells: A Handbook of Defenses*
1-LS1-2: From Molecules to Organisms: Structures and Processes Obtain information from multiple sources to determine patterns in parent and offspring behavior that help offspring survive.	**Animal and Plant Defenses: Spikes, Shells, and Camouflage** In Lesson 3.2 and Lesson 3.4, students read the grade-appropriate book *Parents and Offspring*, which provides photos and descriptions of the care of offspring by parents. In Lesson 3.5, students view and discuss videos in which young offspring signal to their parents in order to receive help. Afterwards, students act out ways that parents help their offspring survive and then write about parental care.
1-LS3-1: Heredity: Inheritance and Variation of Traits Make observations to support an evidence-based claim that most young are like, but not exactly like, their parents.	**Animal and Plant Defenses: Spikes, Shells, and Camouflage** In Lesson 3.1, students observe and construct an evidence-based understanding using photographs of parent and offspring organisms, concluding that young plants and animals are like, but not exactly like, their parents. In Lesson 3.2, students act out the defensive structures of plants and animals and their offspring. The emphasis of the activity is that parents and offspring have the same structures. The book *Parents and Offspring*, read in Lesson 3.2 and 3.5, includes photos of parents and offspring, providing opportunities for comparison, and states that "offspring look a lot like their parents. They may not look exactly the same, though." (p5)
1-ESS1-1: Earth's Place in the Universe Use observations of the sun, moon, and stars to describe patterns that can be predicted.	**Spinning Earth** Throughout the unit, students use observations of the sky as evidence that helps them uncover patterns of day and night in different places on Earth and during different seasons. In Lesson 1.2, students go outside to make, record, and discuss observations of the sky during the school day. Afterwards, they read*After Sunset* to gather evidence from someone else's observations of the night sky.

	In Lesson 1.3, students sort their Sky Observations data, classifying objects observed during the daytime, the nighttime, and both. In Lesson 2.2, students use globes and their own heads as models of the Earth in order to make sense of patterns of daytime and nighttime. In Lesson 3.3, the class makes observations of the Sun's position in the sky at different times of the day. They make similar observations in Lesson 1.4 to discover that there is a repeating pattern to the observed position of the sun in the Sky at different times of day.. Books: *Nighttime Investigation* *Patterns of Earth and Space*
1-ESS1-2: Earth's Place in the Universe Make observations at different times of year to relate the amount of daylight to the time of year.	**Spinning Earth** In Lesson 5.1, students read *A Walk Through the Seasons* and analyze a girl's observations through different seasons. In Lesson 5.2, students analyze images from *Patterns of Earth and Space* then write about how the length of daytime differs in different seasons.

Grade 2

South Carolina Performance Expectation	Amplify Science Unit(s) & Specific Activities
2-PS1-1: Matter and Its Interactions Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	**Properties and Materials** In Lesson 1.2, students read the book *What If Rain Boots Were Made of Paper*?, which gives examples of different materials and their properties. Afterwards, students reflect on these materials and properties. In Lesson 1.3, students conduct an investigation to observe and record the properties of two Mystery Glues and draw preliminary conclusions about whether they are the same.

	In Lesson 1.5, students observe four possible glue ingredients (salt, baking soda, flour, and cornstarch) while dry (Activity 2) and when mixed with water (Activity 3) and reflect on these materials and properties (Activity 4), and work in their *Properties of Materials* Investigation Notebooks recording their observations, classifying the materials observed, and drawing conclusions. In Lesson 4.3, students work with digital tools that allow them to describe and classify materials by their observable properties. First students label various liquid and solid food ingredients with their observable properties, then they determine which combinations of ingredients would create mixtures with particular properties. The reference book *Handbook of Interesting Ingredients* used throughout the unit describes a variety of substances, listing their important properties. Books: *What If Rain Boots Were Made of Paper*? *The Handbook of Interesting Ingredients*
2-PS1-2: Matter and Its Interactions Analyze data obtained from tests to determine which materials have the best properties for an intended purpose.	**Properties and Materials** Throughout the unit, students are challenged to design a glue with specific properties. They research and test different materials and combinations to improve their design. For example, in Chapter 1, Lesson 1.5, students set up sticky tests to compare four possible glue ingredients, and in Lesson 1.6, they evaluate the results of their sticky tests, recording data in their *Properties ofMaterials* Investigation Notebooks and using a digital tool to graph and analyze the results. After a series of iterations, students create their final recipes in Chapter 4, Lesson 4.2. In Lesson 1.2, students read the book *What If Rain Boots Were Made of Paper?*, which uses humorous examples to illustrate that different materials may be better suited to different purposes. Books: *What If Rain Boots* *Were Made of*

	Paper? Jelly Bean *Engineer* *Jess Makes Hair Gel* *The Handbook of Interesting Ingredients*
2-PS1-3: Matter and Its Interactions Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.	**Properties and Materials** In Lesson 2.1, students read and discuss the book *Can You Change It Back?.* In the section titled "A Different Kind of Change: Rearranging," on pages 22-23, it uses the example of popsicle sticks to convey that the same pieces can be arranged in different ways to create different objects. Students discuss this concept in Activity 4. In Lesson 2.1, Activity 4, there is a Going Further opportunity for students to design a structure that can be built from small objects of popsicle sticks (See "Teacher Support" tab in the Teacher's Guide). In Lesson 1.9 and Lesson 3.2, there are Instructional Suggestions for students to model making different mixtures with color blocks (See "Teacher Support" tab in the Teacher's Guide).. This helps students understand that a variety of objects/mixtures can be made from the same smaller objects/ingredients. Books: *Can You Change It Back?*
2-PS1-4: Matter and Its Interactions Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	**Properties and Materials** In Lesson 2.1, students read the book *Can You Change It Back?*, which provides examples of reversible and irreversible changes caused by heating and cooling. In Lesson 2.2, Activity 2, students compare properties of a heated (and cooled) cornstarch and water mixture with those of an unheated mixture and set up a sticky test. They carefully record their observations and evidence in their *Properties of Materials* Investigation Notebooks, and predict which substance will be "more sticky". In Lesson 2.2, Activity 3, students participate in two digital card sorts of materials before and after they have been heated or cooled. They recall what they learned previously and evidence from *Can You Change It Back?*

	to construct arguments for which items will change back to their original forms after heating or cooling. Books: *Can You Change It Back?*
2-LS2-1: Ecosystems: Interactions, Energy, and Dynamics Plan and conduct an investigation to determine what plants need to grow.	**Plant and Animal Relationships** In Lesson 2.1, students read the book *Can You Change It Back?*, which provides examples of reversible and irreversible changes caused by heating and cooling. In Lesson 2.2, Activity 2, students compare properties of a heated (and cooled) cornstarch and water mixture with those of an unheated mixture and set up a sticky test. They carefully record their observations and evidence in their *Properties of Materials* Investigation Notebooks, and predict which substance will be "more sticky". In Lesson 2.2, Activity 3, students participate in two digital card sorts of materials before and after they have been heated or cooled. They recall what they learned previously and evidence from *Can You Change It Back?* to construct arguments for which items will change back to their original forms after heating or cooling. Books: *Can You Change It Back?*
2-LS2-2: Ecosystems: Interactions, Energy, and Dynamics Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.	**Plant and Animal Relationships** In Lessons 3.2 and 3.3, students create a classroom model habitat in which they model interactions between plants and animals. Students discover interdependence between plants and animals as they observe that animals eat fruits, move around their habitats, and leave droppings with seeds inside, which disperses the seeds. The Hiding Seeds Model, which students set up in Lesson 3.1 and return to in Lesson 3.5, also supports students in understanding how some animals disperse seeds by hiding and forgetting about them.

	In Lesson 3.4, students create a diagram to represent relationships among the plants and animals in a broadleaf forest to support their understanding of interdependence among plants and animals in a habitat. In Lesson 4.4, students gather information from the Handbook *of Habitats* as they use a digital app to categorize how different seeds get dispersed, including various mechanisms that involve animals. Books: *Habitat Scientist* discusses the interdependence of plants and animals in a habitat, including pollination and seed dispersal. *Handbook of Habitats* describes several habitats including animal/plant relationships such as pollination and seed dispersal. *Investigating Seeds* describes children investigating seeds which turn out to be dispersed by animals
2-LS4-1: Biological Evolution: Unity and Diversity Make observations of plants and animals to compare patterns of diversity within different habitats.	**Plant and Animal Relationships** In Lesson 1.3, Hands-On, students investigate a sample study site and make drawings of plants and animals that live in the study site habitat in their *Plant and Animal Relationships* Investigation Notebooks. They also observe the plants and animals that live in a sample study site in the Bengal Tiger Reserve. In Lesson 1.2, students read and discuss *My Nature Notebook*, in which a child makes and records observations about the plants and animals in forest habitat. In Lesson 3.4, the class diagrams plant and animal interactions in a mountain habitat and then students diagram plant and animal interactions in a broadleaf forest habitat, providing an opportunity for comparison. Books: *My Nature Notebook* *The Handbook of Habitats* describes several different habitats and the different organisms that live in each one, providing opportunities for comparison across habitats.

2-ESS1-1: Earth's Place in the Universe Use information from several sources to provide evidence that Earth events can occur rapidly or slowly.	**Changing Landforms** Throughout Chapter 3, students investigate the slow erosion of solid rock. For example, in Lesson 3.2, Activity 2, the class conducts a mountain erosion model that demonstrates how it takes a long time for small changes to a landform to add up to noticeable changes. In Lesson 3.4, Activity 1, students examine maps from different times showing an island as it slowly changes due to erosion and discuss how long ago the landform looked the way it does in each map. For each landform presented in the reference book, *Handbook of Land and Water*, there is information on ways that the landform can change slowly and ways that the landform can change quickly. Students read entries about slow changes in Lesson 3.3 and read about fast changes in Lesson 4.1. In Lesson 3.3, students order a set of erosion cards, from the geologic event that would take the least amount of time to the geologic event that would take the longest amount of time. Throughout Chapter 4, students investigate relatively fast erosion of landforms composed of loose materials. For example, in Lesson 4.1, Activity 1, students view images of a cliff composed of loose material that eroded quickly after a large storm. In Lesson 4.2, Activity 2, students model slow and fast erosion using a spray bottle, a large piece of chalk and a mound of sand. Books: *Handbook of Land and Water*
2-ESS2-1: Earth's Systems Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	**Changing Landforms: The Disappearing Cliff** In Lesson 4.5, Student to Student Discussion students are presented with two different solutions to slow or prevent erosion. They discuss the pros and cons of each solution and generate other possible solutions. In Lesson 2.3, students read *What's Stronger? How Water Causes Erosion*, which describes how water changes the shape of landforms.

	In Lesson 4.2, students model how water erodes landforms and observe a model of how wind erodes landforms. In Lesson 3.4 and Lesson 4.4, students use digital apps to model how water could change the shape of mountains and islands overtime. Books: *Handbook of Land and Water What's Stronger?*
2-ESS2-2: Earth's Systems Develop a model to represent the shapes and kinds of land and bodies of water in an area.	**Changing Landforms** In Lesson 4.3, students read the book *Making Models of Streams*, which follows scientist Chris Cianfrani and her students as they use a model to investigate flooding in a stream. The reference book *Handbook of Land and Water* provides several maps showing the shapes of land and bodies of water. Students focus on interpreting these maps in Lesson 3.1, Activities 1-3. In Lesson 3.1, Activity 4, students use a digital tool to create maps of land and water. Books: *Landform Postcards* *Making Models of Streams* *Handbook of Land and Water*
2-ESS2-3: Earth's Systems Obtain information to identify where water is found on Earth and that it can be solid or liquid.	**Changing Landforms** The reference book *Handbook of Land and Water*, used throughout the unit, provides several examples of bodies of water in different locations. In Lesson 2.3, students read and discuss the book *What's Stronger? How Water Causes Erosion* and discuss examples of liquid and solid water in the book. *Books:* *What's Stronger? How Water Causes Erosion Handbook of Land and Water*

2-ESS3-1: Earth and Human Activity Design solutions to address human impacts on natural resources in the local environment.	**Changing Landforms** Students build on their understanding of Earth systems as they investigate how erosion is affecting a cliffside. Students learn that most landforms are made of rock and that rock can change. Through investigations and models, students construct an understanding of how wind and water can change the shape of a land by eroding sand and rock over long time spans. Some landforms are made of loose materials such as sand or packed dirt. These landforms can erode much more quickly than landforms made of solid rock. Students analyze features of maps to learn that people use maps to visually represent land and water on Earth, and they identify patterns where water is located. Students learn that water is found in the ocean, rivers, streams, lakes, and in precipitation. In Lesson 2.5, students use physical models to investigate how water erodes landforms, focusing in particular on the scale of the pieces that erode from landforms. Students use evidence from the Chalk Model to support the idea that water erodes landforms. In Lesson 4.1, Students create diagram models to show their initial ideas about how a landform could erode quickly. They then obtain information about how wind and water can cause landforms that are less stable to erode more quickly than landforms made of solid rock. In Lesson 4.4, Students create digital models to show how much two different landforms could erode in one storm. They then communicate their ideas about what causes some landforms to erode slowly, while others erode more quickly. In Lesson 4.5, Students create diagram models to show how a cliff near the recreation center changed overnight, and they write explanations about why it eroded so quickly. Books: Handbook of Land and Water What's Stronger

Grade 3

South Carolina Performance Expectation	Amplify Science Unit(s) & Specific Activities
3-PS2-1: Motion and Stability: Forces and Interactions Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	**Balancing Forces** Students plan and conduct investigations to gather evidence about touching and non- touching unbalanced forces in Chapters 1and 2: In Lesson 1.2, students explore unbalanced touching forces as they investigate different ways to get objects such as blocks to move. In Lesson 2.1, students plan and conduct an investigation of non-touching unbalanced forces as they investigate how to make magnets move without touching them. They then use a digital app to diagram and label the forces acting on an object. In Lessons 3.1 and 3.1, students gather evidence about how the force of gravity influences objects through hands-on investigation and reading texts. In Lesson 3.3, students make observations and discuss them as they investigate different unbalanced forces acting in a chain reaction involving touching forces, magnetic force, and gravity. In Lesson 3.4, students reflect on the patterns from their observations, and use their understanding to create digital models that diagram different kinds of forces and their effects on the motion of objects. Students then build their understanding of balanced forces in Chapter 4:
3-PS2-2: Motion and Stability: Forces and Interactions Make observations and measurements of an object's motion to provide evidence that a pattern can be used to predict future	**Balancing Forces** In Lesson 2.2, students make predictions about how a magnet affects the movement of different objects, identifying a pattern that can be used to predict the movement of other objects

motion.	In Lesson 3.3, students make and discuss observations as they investigate different forces acting in a chain reaction involving touching forces, magnetic force, and gravity. In Lesson 3.4, students reflect on the patterns from their observations and use their understanding to create digital models that diagram different kinds of forces and their effects on the motion of objects. In Lesson 5.3, students expand their understanding of patterns of motion as they make observations of a swinging block in order to identify patterns and make predictions about future movement. Students apply what they have learned to diagram repeating patterns of a bouncy ball and a bicycle wheel. Books: *Handbook of Forces* *Hoverboard*
3-PS2-3: Motion and Stability: Forces and Interactions Ask questions to determine cause-and-effect relationships of electric interactions and magnetic interactions between two objects not in contact with each other.	**Balancing Forces** In Lesson 2.1, students investigate non-touching unbalanced forces as they investigate how to make magnets move without touching them. In Lesson 3.3, students make and discuss observations as they investigate different unbalanced forces acting in a chain reaction involving touching forces, magnetic force, and gravity. In Lesson 5.2, students read *Hoverboard*, which introduces them to

	electromagnets. Students learn how the magnetic force that can be turned on or off allows the floating skateboard to float, and then come back down onto the ramp. In Lesson 5.3, students investigate electromagnets in a physical demonstration and read about electromagnets in the Handbook *of Forces*. Then in 5.4, students use a digital app, the Diagramming Tool, to help them understand how electrical and magnetic interactions explain how the train in Faraday could rise, then float, then fall back down onto the track. They write a scientific explanation of the floating train in Lesson 5.5. Books: *Handbook of Forces* *What My Sister Taught Me About Magnets* tells the story of a girl who investigates magnets and how they interact with each other and metal objects.
3-PS2-4: Motion and Stability: Forces and Interactions Develop possible solutions to a simple design problem by applying scientific ideas about magnets.	**Balancing Forces** Students are challenged to explain how a floating train works in order to reassure nervous citizens. To solve the mystery, students plan and conduct investigations, analyze patterns in data, and obtain information about magnetic force, gravity, and balanced and unbalanced forces. Students write explanations and create physical models and diagram models to show why the train's vertical motion is stable at times and changes at times. In Lesson 2.2, students identify patterns in data (patterns) based on their investigations of which objects magnetic force can move/act upon. This data also can be used as evidence to support their growing understanding of non-touching forces. In Lesson 2.3, students plan and conduct investigations with two magnets and a paper clip, and they obtain information from a reference book about the ways magnetic force can change the motion of objects by attracting or repelling. They explain what they have learned, identify patterns of change in motion, and can use those patterns to predict the effects of magnets on

	different objects. In Lesson 2.4, students obtain information by reading about a young girl's magnet investigations. They then use mathematical and computational thinking to analyze the data tables the girl makes about how how magnetic forces act. In Lesson 2.5, students apply what they have learned about non-touching forces, magnetic forces, and change (stability and change) by making models and writing explanations showing what causes the train to rise without anything touching it. In Lesson 3.3, students observe changing motion as evidence of touching forces, magnetic forces, and gravity in chain reactions they design. They compare and contrast magnetic force and gravity based on patterns in data and construct sentences to communicate their understanding. In Lesson 4.2, students discover how balanced forces can make an object's motion stable using information from a reference book to design and build a physical model that balances gravity and magnetic force on a floating paper clip. Books: What My Sister Taught Me About Magnets
3-LS1-1: From Molecules to Organisms: Structures and Processes Develop and use models to describe how organisms change in predictable patterns during their unique and diverse life cycles.	**Inheritance and Traits** In Lesson 1.1 Activity 4, students preview a reference book looking for similarities and differences, with a focus on life cycles. In Lesson 1.2, students read and reflect on the way in which organisms can vary, but can still have things in common. Books: *Blue Whales and Buttercups Handbook of Traits*

3-LS2-1: Ecosystems: Interactions, Energy, and Dynamics Construct an argument that some animals form groups that help members survive.	**Inheritance and Traits** In Lesson 3.1, students review and discuss data about the hunting styles of two different wolf packs.The different packs hunt different kinds of animals together (elk or bison), which results in the formation of groups of different sizes. In Lesson 3.2, the teacher leads a discussion about the vervet monkeys in the Sparrow book about how they learn from groups in their environment and stay in groups in order to meet their needs for survival. The class connects this idea to the wolf packs they have been investigating. A key concept is posted about this: Organisms stay in groups in order to obtain food and meet their needs. The number of organisms in a group varies. In Lesson 3.2 students have the additional opportunity to read about group behavior and brainstorm other examples of group behavior that helps members survive. Students act out the survival behavior and other students identify evidence of how being in a group helps members survive. Books: *How the Sparrow Learned Its Song Handbook of Trait*
3-LS3-1: Heredity: Inheritance and Variation of Traits Analyze and interpret data to provide evidence that plants and animals have inherited traits that vary within a group of similar organisms.	**Inheritance and Traits** In Lessons 2.1 and 2.2, students analyze data about fruit fly parents and offspring and find patterns that show that traits are inherited from parents using their *Inheritance and Traits Investigation Handbook*. In Lesson 2.2 and 2.5, students use a digital app to model patterns of trait inheritance from parent to offspring, including similarities and variation among traits. In Lesson 2.4, students build clay creature offspring of parents with specific traits, applying inheritance rules. Students compare creatures and observe that even though the offspring inherited instructions from the same parents, there is variation in traits among siblings. Books:

	Handbook of Trait includes descriptions of "variation in the species" for several different species, as well as providing photos of groups of organisms that provide opportunities to observe variation. *The Code* explores variation in humans and explains how traits are inherited through genes, using humans as the primary example but expanding to all living things.
3-LS3-2: Heredity: Inheritance and Variation of Traits Use evidence to support the explanation that traits can be influenced by the environment.	**Inheritance and Traits** In Lesson 3.1, students analyze data about feather color in flamingos and discover that this trait is influenced by the flamingos environment. In Lesson 3.2, the nonfiction book *How the Sparrow Learned Its Song* describes how traits can be changed through learning, experiences, and other environmental factors, providing several examples. In Lesson 3.3, students conduct a hands-on investigation of an inherited trait (the green color of celery) that can be affected by the environment. They also reflect on class traits posters and consider environmental factors that may have influenced their own traits. In Lesson 3.5, students use a digital app to create a model that demonstrates their understanding that an organism's traits can be influenced by interactions with the environment. In Lessons 3.3 and 3.6, students write an explanation supported by evidence to explain two traits in the wolves of Graystone National Park: one trait that is determined by the wolves' environment, and an inherited trait that is also influenced by the environment. Book: *Handbook of Traits*
3-LS4-1: Biological Evolution: Unity and Diversity Analyze and interpret data from fossils to provide evidence of organisms and the environments in which they lived long ago.	**Environments and Survival** In Lesson 2.2, students read about different fossil mouths and discuss inferences they can make about each organism and the food in its environment using the structures of the mouth as evidence.

	In Lesson 2.3, students make observations of fossils and use their observations to determine how the organism met its needs and what its environment might have been like. *Books:* *Mystery Mouths includes photos of fossil skulls for students to observe and make inferences about.* *Biomimicry Handbook, includes a camera lens design based on fossil trilobite eyes.*
3-LS4-2: Biological Evolution: Unity and Diversity Use evidence to construct an explanation for how the variations in traits among individuals of the same species may provide advantages in surviving and producing offspring.	**Environments and Survival** In Lesson 2.1, students engage in a classroom model (Hummingbird Model) to discover that, in a given environment, organisms with certain traits may be more likely to survive, and organisms with certain traits may be less likely to survive. In Lesson 2.4, students use the pocket mice model to discover that mice with adaptive traits are more likely to survive and reproduce in their environment and those with non-adaptive traits are more likely to die. In Lesson 2.6, Activities 1 and 3, students analyze data about a snail population showing snails with different traits over time and the environment they live in. Students write an explanation for why snails with yellow shells have been decreasing while those with banded shells have been increasing. Books: Environment News in the form of fictionalized newspaper articles, tells true stories of environmental changes that caused some organisms in a population to survive better than others, resulting in shifts in the prevalence of certain traits. Biomimicry Handbook describes how a male blue morpho butterfly's brilliant wing color helps it get mates and reproduce (p18)
3-LS4-3: Biological Evolution: Unity and Diversity Construct an argument with evidence that in a particular habitat some organisms can thrive, struggle to survive, or fail	**Environments and Survival** In Lesson 1.2, a teacher led discussion introduces students to survival needs. Then, students evaluate the survival needs of different organisms and use evidence to make arguments about whether or not those organisms can

to survive.	successfully survive in a variety of environments. In Lessons 1.5, students use evidence from data cards to construct arguments about why grove snails with yellow shells are less likely to survive than grove snails with banded shells. In Lessons 2.6, students use evidence from new data cards to construct arguments about why grove snails with yellow shells are less likely to survive than grove snails with banded shells in their environment In Lessons 3.4, students use evidence from a new set of data cards to construct arguments about why grove snails with yellow shells were more likely to survive in their environment than grove snails with banded shells 10 years ago. Books: *Earthworms Underground Environment News* This idea is also reinforced in the Weather and Climate unit. Throughout Chapters 1-3, students gather data and make arguments about which island habitat would best allow orangutans to survive, based on climate.
3-LS4-4: Biological Evolution: Unity and Diversity Make a claim about the effectiveness of a solution to a problem caused when the environment changes and affects organisms living there.	**Environments and Survival** In Lesson 3.2, students read and discuss changes that happen in different environments. They discuss how each change affects the plants or animals that live in that environment, and how that affects which traits in a population are adaptive. Students will record their inferences in their Investigation Notebook. In Lesson 3.4, students analyze data about a population of snails over time using information about changes that have happened in their environment. They write an explanation about why some snails in the population were more likely to survive before the environment changed, rather than after.
3-ESS2-1: Earth's Systems Represent data in tables and graphical displays of typical weather conditions during a particular season to identify patterns and make predictions.	**Weather and Climate** In Lesson 3.2, students use a digital tool to complete bar graphs showing average high temperature by month in one location over three years. Students use the data to predict the temperature during the month five years in the future.

	In Lesson 3.5, students obtain information from a reference book, *World Weather Handbook,* about climate in different places around the world. They use graphs showing average temperature and average precipitation to compare the seasons in different places. In Chapter 3, Lesson 3.5, the class graphs local average high temperatures for a year and uses this to identify hot and cold and wet and dry seasons in their area. Books: *Seeing the World Through Numbers* discusses how daily temperature and rainfall data can be represented in different ways, such as tables and line plots, to reveal trends. *World Weather Handbook*
3-ESS2-2: Earth's Systems Obtain and combine information to describe climate patterns in different regions of the world.	**Weather and Climate** The reference book *World Weather Handbook,* used several times throughout the unit, provides graphs of monthly average temperature and rainfall data for 19 diverse locations around the world, along with descriptions of climate in those locations. In Lesson 3.4, students read the book *What's Going On with the Weather?* and compare the climates of two cities, Boston and San Francisco. In Lesson 2.3, students analyze three line plots showing 30 days of temperatures in different places around the world. Students use the data to identify which place was the warmest and which was the coolest during the month shown.
3-ESS3-1: Earth and Human Activity Make a claim about the effectiveness of a design solution that reduces the impacts of a weather related hazard.	**Weather and Climate** The nonfiction book *Dangerous Weather Ahead* describes hazardous weather typical of different regions of the United States and presents design solutions that people have devised in order to prepare for these hazards. In Lesson 4.3, students build and test hurricane structures that meet certain criteria, including staying up during heavy wind and rain.

	In Lesson 4.4, students make a claim and support their claim with evidence about how an organization, located in Florida, should prepare for natural disasters. Students use data about where certain natural disasters have occurred in the past and information about particular design solutions. Books: *Dangerous Weather Ahead*

Grade 4

South Carolina Performance Expectation	Amplify Science Unit(s) & Specific Activities
4-PS3-1: Energy Use evidence to construct an explanation relating the speed of an object to the energy of that object.	**Energy Conversions** In Lesson 1.3, students build simple electrical systems and observe how changing the amount of light that reaches a solar panel changes the speed of a fan the light energy is powering. In Lesson 1.4, students are introduced to the term "energy" and discuss evidence of energy, including motion energy. In Lesson 1.5, students read about forms of energy, including motion energy, in *It's All Energy*. In Lesson 3.4, students design and build a wind turbine. They read about the relationship between speed and energy in *It's All Energy* to inform their design decisions.
4-PS3-2: Energy Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	**Energy Conversions** In Lesson 1.4, students explore the Energy Conversions Simulation and observe that different forms of energy are inputs and outputs of different devices—sound, light, heat, electrical, and motion.

	In Lesson 1.5, students create simple electrical systems, which use electrical energy to light up an LED (light energy), make a buzzer hum (sound energy), and make a fan spin (motion energy). Then they read about forms of energy in It's All Energy. Finally, students synthesize ideas from text and their hands-on experience to understand that electrical, light, motion, sound, and thermal energy are all forms of energy. In Lesson 2.1, students read a section on energy converters, devices that convert energy from one form to another, in the reference book It's All Energy. Afterwards, they explore energy conversions in the Energy Conversions Simulation, analyzing the amount of energy transferred into the systems they create and the amount of energy transferred out or left in the system after conversion. The discussion of this activity focuses on the conservation of energy. In Lesson 2.2, students read *Energy Past and Present* which traces energy transfers and conversions from one form to another in a variety of modern electrical devices, as well as other types of devices from the past. In Lesson 2.3, through a demonstration with an electrical system and a physical model, students discover that the amount of energy available in a system is limited. In Lesson 4.2, students participate in a demonstration that emphasizes how energy must be transferred from a source to a device for an electrical system to work. They trace the transfer of energy through an energy system, from the sun to a solar panel that converts the light energy to electrical energy, through the wires of the electrical grid, to devices that convert electrical energy into other forms of energy. Books: *It's All Energy* *Energy Past and Present*
4-PS3-3: Energy	**Waves, Energy, and Information**

Ask questions and predict outcomes about the changes in energy that occur when objects collide.	In Lesson 2.1, students read the book Sound on the Move, which shows how sound waves move through materials like air, water, and the ground by way of particle collisions. In Lesson 2.3, students observe how sound travels by way of particle collisions in the Sound Waves Simulation. They also continue to read Sound on the Move and visualize how sound travels through particle collisions. In Lesson 2.4, students use coins to investigate how energy is transferred from one object to another during a collision, then connect their discoveries to how sound travels. In Lesson 2.5, students create kinesthetic and digital models to show how sound energy is transferred in particle collisions. Books: Sound on the Move **Energy Conversions** In Lesson 3.4, students read about wind turbines, which function when moving air collides with the blades of the turbine, on page 18 of *It's All Energy*. They also read about how energy is transferred in collisions on page 45 of *It's All Energy*. Students use these ideas to design their own wind turbines. Books: *It's All Energy*
4-PS3-4: Energy Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	**Energy Conversions** In Lesson 2.1, students read a section on energy converters, devices that convert energy from one form to another in the reference book *It's All Energy*. Afterwards, students examine energy conversions in the Energy Conversions Simulation. In Lesson 2.2, students read *Energy Past and Present* which traces energy transfers and conversions from one form to another in a variety of modern

	electrical devices as well as past devices. In Lesson 2.4, students test different systems for converting electrical energy to light energy using the Energy Conversions Simulation. In Lesson 3.2, students observe the teacher building a simple electrical system in which a generator converts motion energy into electrical energy. Afterwards, using the Energy Conversions Sorting Tool, students sort energy converters based on their function in the electrical system. In Lesson 3.3, students read *Sunlight and Showers*, in which engineers design, test, and refine a solar water heater that converts light energy into thermal energy. In Lessons 3.4 and 3.5, students complete a design challenge to build a functioning wind converter (a wind turbine and generator) that meets certain criteria. Books: It's All Energy Energy Past and Present Sunlight and Showers
4-PS4-1: Waves and their Applications in Technologies for Information Transfer Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.	**Waves, Energy and Information** In Lesson 1.2, students explore and observe patterns of motion in slinky and rope waves. In Lesson 1.3, students read Warning: Tsunami!, which describes how tsunamis travel as waves, and reflect on the pattern of motion in a wave. In Lesson 3.1, students investigate amplitude using the Sounds Waves Simulation and analyze and complete a model of a sound wave, a waveform, in their Student Investigation Notebooks. In Lesson 3.2, students explain amplitude in Activity 1, investigate pitch in Activity 2, and discover the relationship between pitch and wavelength using the Sounds Waves Simulation in activity 3. Students record data and observations of patterns in their Student

	Investigation Notebooks. In Lesson 3.3, students describe sounds, in terms of volume and pitch, and the waveforms for the sounds, in terms of amplitude and wavelength. Afterwards, students continue to explore amplitude, wavelength, and sound in the book Patterns in Communication and record ideas in their Student Investigation Notebooks. In Lesson 3.3, students develop models of different sounds, demonstrating their understanding of patterns in sound waves by connecting amplitude and volume, and wavelength and pitch, in the Sounds Waves Sorting Tool. In Lesson 3.4, students read Seeing Sound and focus on patterns in the visualizations of sound in the book. Books: Patterns in Communication Seeing Sound
4-PS4-2: Waves and their Applications in Technologies for Information Transfer Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	**Vision and Light** In Lesson 2.1, students investigate the path of light that allows an animal to see an object in the Vision and Light Simulation. In Lesson 2.2, students use a digital Modeling Tool to create and discuss models of the path of light from a light source to an object to the eye, allowing an object to be seen. They return to the Modeling Tool in Lesson 2.4. In Lesson 2.3, students read and reflect on the book I See What You Mean, in which two friends build a detailed explanation of how vision works. Together, they trace the path of light from a source to an object to their eyes. In Lesson 2.4, students return to the Vision and Light Simulation to gather evidence that, for an animal to see an object, light must reflect off the object and go into an animal's eyes. After investigating

	the path of light that allows objects to be seen in the Sim, student pairs use evidence to critique and share ideas for improving models that depict alternate conceptions of light and vision. Books: I See What You Mean
4-PS4-3: Waves and their Applications in Technologies for Information Transfer Generate and compare multiple solutions that use patterns to transmit information.	**Waves, Energy, and Information** Using physical and computer models to observe and analyze patterns , students figure out how sound travels as a wave. They apply that knowledge to explain how dolphins in the fictional Blue Bay send and receive signals underwater when separated and how humans encode, send, and receive patterns of information for efficient communication across distances. In Lesson 1.2, students use physical models to observe wave motion and discover that waves move in patterns. In Lesson 1.3, students read the book Warning: Tsunami! to obtain and evaluate information about waves as a pattern of displacement rather than the movement of matter across distances, and how scientists can use patterns to predict and mitigate the impact of natural disasters. In Lesson 2.3, students use the Sound Waves Simulation to observe what happens at the particle level and discover that sound waves are patterns of motion that occur when particles collide and spread apart. In Lesson 3.2, students interpret waveform data from the Sound Waves Simulation showing that sounds can have different pitches and that sounds with different pitches have different wavelengths. In Lesson 3.3, students read a section of the book Patterns in Communication to obtain information before communicating their findings about how changes in wavelength and amplitude affect the pitch and volume of sounds. In Lesson 3.4, students read the book Seeing Sound and analyze visual representations of patterns in visual representations of sound.

	In Lesson 3.6, students use the Sound Waves Simulation to reproduce dolphin signature whistles based on their understanding of the relationship between a sound's wavelength and pitch, attending to the material the sound is traveling through. Students then engage in a whole class model of dolphin communication. In Lesson 4.1, students read the book Patterns in Communication to obtain information about how humans use patterns such as codes to communicate. In Lesson 4.2, students decode an image communicated in binary code and compare the structure and function of alternative solutions to the problem of reliable long-distance communication. In Lesson 4.4, students send, receive, and decode images communicated across a distance in binary code. They then construct written explanations about how sound waves and digital devices are used for communication Books: Patterns in Communication Seeing Sound Warning: Tsunami!
4-LS1-1: From Molecules to Organisms: Structures and Processes Construct an argument that plants and animals have internal and external structures that function together in a system to support survival, growth, behavior, and reproduction.	**Vision and Light** In Lesson 1.2, students are guided through a slideshow of animal structures and discuss their different functions in allowing animals to use their senses to get information from their environment that helps them survive. In Lesson 1.4, students watch videos of animals, focusing on the structures the animals use to get information about their environments, and how that information helps them survive. In Lesson 3.1, students use the Vision and Light Simulation to

	discover the function of different internal eye structures. In Lesson 3.4, students use the Vision and Light Sorting Tool to make sense of their ideas about how an animal sees, recognizes, and reacts to prey in its environment in order to get food to support growth and survival. They construct an argument that animals' internal and external structures allow them to survive. In Lesson 4.1, students read Seeing Like a Shrimp and Smelling Like a Snake, asking questions as they read to make sense of how animals' internal and external structures help them sense information from their environment in different ways. Books: Seeing Like a Shrimp and Smelling Like a Snake Handbook of Animal Eyes is a reference book used throughout the unit to support student understanding of vision and eye structures. This reference book includes cross-section diagrams of eyes, vivid close-up photos, and accessible text about the eyes of humans and the eyes of a diverse set of twenty other animals. Each entry contains information about the structures of that animal's eyes, such as the sensitivity of the receptors. Also included are descriptions of how vision helps the animal survive.
4-LS1-2: From Molecules to Organisms: Structures and Processes Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.	**Waves, Energy, and Information:** In Lesson 2.1, students read the book Sound on the Move, which describes examples of animals using sound to communicate. In Lesson 3.3, students read in a reference book, Patterns in Communication, about how treehoppers make sounds with different wavelengths to communicate. In Lesson 3.5, students read The Scientist Who Cracked the Dolphin Code, a book about a real scientist who uses visual representations to depict sound. It highlights her discovery of how dolphins

	recognize each other based on the pitch of their signature whistles. In Lesson 3.7, students write scientific explanations about how a dolphin calf hears his mother's call and recognizes it as his mother's. In Lesson 4.1, students read about how humans use patterns to communicate as they send and receive information through different senses. Books: Sound on the Move Patterns in Communication The Scientist Who Cracked the Dolphin Code
4-ESS1-1: Earth's Place in the Universe Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.	**Earth's Features** In Lesson 2.1, students read Through the Eyes of a Geologist, about the inferences geologists can make about the past environment of a place, based on observations of rocks and fossils that exist in the present. In Lesson 2.4, students use the Earth's Features Simulation to investigate what different rock layers in one location suggests about its environmental history. In Lesson 3.1, students return to thinking about a rocky outcrop in Desert Rocks Canyon to discuss the rock layers and their ideas about the order in which they formed. In Activity 2, students explore the order in which rock layers form with a model using sheets of paper. In Activity 3, students return to the Sedimentary Rock Formation Models (which they began in Chapter 1 and continued to create in Chapter 2) to reflect on the order that the rock layers in their model formed. In Activity 4, students analyze the rock layers in Hunstanton Cliff (in England) to identify evidence and draw conclusions about the order in which the rock layers formed over time.

	In Lesson 3.2, students read about rock layer formation in Fossil Hunter's Handbook. Then they return to their Class Sedimentary Rock Formation Model to gather evidence to explain that landforms change over time. In Lesson 3.4, students use rock and fossil evidence to explain environmental changes that happened in a place over time. Books: Through the Eyes of a Geologist Fossil Hunter's Handbook
4-ESS2-1: Earth's Systems Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	**Earth's Features** In Lesson 4.1, students are introduced to the problem surrounding a new phenomenon - why one canyon is much deeper than another in a nearby area. Then, students read Rocky Wonders which introduces them to the variety of ways that water, ice, wind, and living things, can erode rocks. In Lesson 4.2, students investigate characteristics of rivers that affect the amount of rock they erode in the Earth's Features Simulation. In Lesson 4.3, students plan and conduct an investigation using the Erosion Model to determine how the amount of time that a river flows affects how much rock erodes. In Lesson 4.4, students plan and conduct a second investigation with the Erosion Model to determine how the speed of a river affects how much rock erodes.

4-ESS2-2: Earth's Systems Analyze and interpret data from maps to describe patterns of Earth's features.	**Earth's Features** In Lesson 1.4, students observe a geologic map, analyze it, and discuss where fossils are most likely to be found based on surface rock types (the map includes locations of different types of rock, as well as volcanoes). In Lesson 4.1, students analyze and interpret a map that shows the location of some of the rock formations they read about in Rocky Wonders. Before reading, students observe and identify patterns on the map and reflect on how these features were formed. After reading, they return to the map to see if their initial predictions are supported by evidence.
4-ESS3-1: Earth and Human Activity Obtain and combine information to describe that energy and fuels are derived from natural resources and how their uses affect the environment.	**Energy Conversions** In Lesson 3.1, students use the Energy Conversions Simulation to understand where the energy in an electrical system comes from. In Lesson 3.1, students read It's All Energy and focus on energy sources (pages 26-40,) to learn about renewable and non-renewable resources. They synthesize their understanding of energy sources from both the digital simulation and the book. In Lesson 3.6, students gather evidence about solar and wind energy from the Energy Conversions Simulation and It's All Energy. Next, they discuss whether solar panels or wind turbines are a better solution for powering Ergstown based on several criteria, including "safe for the environment." Finally, they write an argument for the design solution they are proposing, which includes the type of energy source they propose to use for powering Ergstown.

	In Lesson 4.4, students obtain information from It's All Energy and the Energy Conversions Simulation about different solutions to improve Ergstown's electrical system, including information about renewable and non-renewable energy sources. In Lesson 4.5, students combine information they obtained about different energy sources as they prepare for and participate in a Town Hall Meeting about how to improve Ergstown's electrical system. Books: It's All Energy
4-ESS3-2: Earth and Human Activity Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	**Waves, Energy, and Information** In Lesson 1.3, students read Warning: Tsunami!, which discusses how scientists detect tsunamis and use models to predict their impact, so that they can warn people to prepare and stay safe. Books: Warning: Tsunami! **Energy Conversions** In Lesson 3.2, students consider backup power sources for a hospital during a blackout. In Lesson 4.1, students read Blackout!, which describes several major blackouts that have occurred in different places around the world. Some of these were caused by natural events, such as droughts, floods, and heat waves, and some sections of the book describe ways that people reduced the impact of these events. In Lesson 4.3, students gather evidence to determine the best

	solution for mitigating problems with the electrical system, including bolstering the electrical grid against storms. In Lesson 4.5, students prepare for and participate in a Town Hall Meeting, in which they discuss different solutions for improving Ergstown's electrical system, including solutions that bolster the electrical grid against storms. Books: Blackout! **Earth's Features** In Lesson 4.1, students read Rocky Wonders, which includes Hazard Warnings! throughout, detailing natural hazards that can occur. In Lesson 4.1, students return to the Rocky Wonders map and revisit their initial ideas about erosion and natural hazards (volcanoes, earthquakes). In Lesson 4.3, students obtain information from Rocky Wonders about natural hazards and reflect in writing on how people could stay safe from hazards. Books: Rocky Wonders

Grade 5

South Carolina Performance Expectation	Amplify Science Unit(s) & Specific Activities
5-PS1-1: Matter and Its Interactions	**Modeling Matter**

Develop a model to describe that matter is made of particles too small to be seen.	In Chapter 1, Lesson 1.3, students read Made of Matter, which introduces the concept that everything around them is made of matter, which is made of tiny particles (atoms and molecules). The book introduces students to models as representations of matter. The teacher leads a discussion using a digital app called the Scale Tool, to help students understand that matter is made of particles that are too small to be observable. Throughout the unit, students develop, analyze, and revise models of matter, building their understanding that the observable properties of a substance are determined by the nanoscale properties of its molecules. In Chapter 1, Lesson 1.4, students observe the separation of dyes at the observable scale (chromatography). In Chapter 1, Lessons 1.4 and 1.5, students investigate and discuss two models that represent chromatography at the nanoscale (Pasta Model in Lesson 1.4; Fan Model in Lesson 1.5). Then, in Chapter 1, Lesson 1.6, students create their own models of what they think happened at the nanoscale during their chromatography tests. They draw their own diagrams, discuss their models with a partner, and then work together to use the Modeling Matter Diagramming Tool to create a digital nanoscale model of chromatography. Students revise their paper models once more in Lesson 1.9. In Lesson 2.3, students read Solving Dissolving, in which a boy uses models to explain what is happening at the nanoscale when a substance does or does not dissolve. In Chapter 2, Lessons 2.2, 2.5, 2.8, and 2.10, students use the Sim to explore

	how the nanoscale properties of the molecules that make up different substances result in different degrees of mixing/solubility. In Chapter 2, Lesson 2.4, students use the Modeling Matter Diagramming Tool to create digital nanoscale models of substances dissolving and not dissolving. In Chapter 2, Lessons 2.6 and 2.8, students use a kinesthetic model (the All Aboard Model) to make sense of how the nanoscale properties of the molecules account for the observable properties of those substances. They also examine how they interact with each other. In Chapter 2, Lesson 2.7, students read Science You Can't See and learn about studies of phenomena that cannot be observed directly. For example, Farid El Gabaly uses an electron microscope to make images of atoms. In Chapter 2, Lessons 2.10 and 2.11, students draw and then use the Modeling Matter Diagramming Tool to create nanoscale models that show how emulsifiers help unmixable substances stay mixed. Throughout the unit, the class creates a Matter Chart, to which they add terms (atom, molecule, substance, mixture) to help students develop their understanding of matter as tiny particles too small to be seen — atoms and molecules — that make up substances and mixtures all around them. Books: Made of Matter (Chapter 1) Break it Down (Chapter 1) Solving Dissolving (Chapter 2) Science You Can't See (Chapter 2) Food Scientist's Handbook, students learn about the nanoscale and observable properties of various food ingredients, and how food scientists use them.
5-PS1-2: Matter and Its Interactions Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.	**The Earth System** In Chapter 2, Lesson 2.5, Activities 3-4, students read Drinking Cleopatra's Tears and synthesize ideas about water, including that water is conserved as it cycles.

	In Chapter 2, Lesson 2.6, Activity 1, students participate in a Roundtable Discussion, in which one of the discussion questions ("Does the amount of water on Earth change over time?") highlights conservation of matter (water). The class discusses conservation of matter during evaporation and condensation, and the teacher posts the key concept: When water changes from gas to liquid or liquid to gas, water molecules are not created or destroyed. Chapter 3, Lesson 2, Activity 3, students use a simulation to measure and graph water vapor in the atmosphere. In Chapter 5, Lesson 5.3, Activity 3, students use the Earth System Modeling Tool to model two chemical reactions and discover that atoms get rearranged but are not created or destroyed during a chemical reaction. The class discusses these models, and the teacher posts the key concept: In a chemical reaction, matter is not created or destroyed. This connects back to the related key concept from Lesson 2.6. Books: Drinking Cleopatra's Tears
5-PS1-3: Matter and Its Interactions Make observations and measurements to identify materials based on their properties.	**Modeling Matter** In Chapter 1, Lesson 1.2, Activities 2-3, students investigate and discuss observable properties of different ingredients in food mixtures. In Chapter 1, Lesson 1.3, students read Made of Matter, where they learn that molecules can have different properties, which helps build the foundation for understanding why substances have different observable properties. In Chapter 1, Lesson 1.4, students conduct a Chromatography Investigation and observe and make qualitative measurements of the separation of different food color dyes. They connect their observations to physical models

	they develop in Chapter 1, Lessons 1.4 (Pasta Model) and 1.5 (Fan Model) as a basis for understanding the separation of different substances. In Chapter 1, Lessons 1.7 and 1.8, students read and discuss Break it Down to learn how scientists use the properties of different substances to separate them. In Chapter 2, Lessons 2.1 and 2.6, students observe differences in the solubility of different substances at the observable scale (through Flavor Ingredient Tests and demonstrations with oil and water and vinegar and water). They build on their observations as they explore different nanoscale models: in the Sim in Lessons 2.5, 2.8, and 2.10; the book Solving Dissolving in Lesson 2.3; physical models (the Pasta Model in Lesson 2.6 and the All Aboard Models in Lessons 2.6; Stability Tests in Lesson 2.9); drawn models (which students create in 2.10 and evaluate in 2.11); and student-created digital models in the Diagramming Tool (Dissolving Model in Lesson 2.4, Emulsifier Model in Lesson 2.11). Books: Made of Matter (Chapter 1) Break it Down (Chapter 1) Solving Dissolving (Chapter 2) Break It Down: How Scientists Separate Mixtures discusses mixtures and the importance in science of being able to separate them into component substances. The book shows students three contexts in which separating a mixture is important: pure water from salty ocean water, plasma from blood, and the original ingredients from the remains of a meal found in an ancient tomb. Each example features a different separation technique. In Food Scientist's Handbook, students learn about the nanoscale and observable properties of various food ingredients and how food scientists use them.
5-PS1-4: Matter and Its Interactions Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	**The Earth System** In Chapter 5, Lesson 5.1, Activity 3, students mix baking soda, calcium chloride, and phenol red solution in a bag and observe that the mixture changes color and temperature, as well as causing the bag to puff up.

	In Chapter 5, Lesson 5.2, Activity 1, students read Chemical Reactions Everywhere and gather information about what constitutes evidence of a chemical reaction: color change, taste change, temperature change, gas formation, electricity is made, and light is made. They synthesize this information with their investigation from Chapter 5, Lesson 5.1, Activity 2, to determine that new substances formed when they mixed calcium chloride, baking soda, and phenol red solution, because the properties of the substances after mixing were different from those of the substances before mixing. In Chapter 5, Lesson 5.3, Activities 1 and 2, students examine nanoscale diagrams to determine what happens to molecules when substances are mixed and a chemical reaction takes place. In Chapter 5, Lesson 5.4, Activity 2, students conduct investigations to determine what mixtures of substances from their Lesson 5.1 investigation will produce particular results, such as a temperature change, the formation of a gas, or the formation of a substance with a different color. Books: Chemical Reactions Everywhere (Chapter 5)
5-PS2-1: Motion and Stability: Forces and Interactions Support an argument that the gravitational force exerted by Earth on objects is directed down.	**Patterns of Earth and Sky** In Chapter 2, Lesson 2.4, Activity 1, students are introduced to the question: If Earth is spinning, which way is up? Then they watch a video of people dropping rocks all over the world to gather evidence that things fall toward Earth, or down. In Chapter 2, Lesson 2.4, Activity 3, students read Which Way is Up? to obtain information about how gravity pulls objects toward Earth, which is why down is always towards Earth. In Chapter 2, Lesson 2.5, Activities 1 and 3, students use the Patterns of Earth and Sky Modeling Tool to show that down is always toward Earth no matter where a person is on Earth.

	In Chapter 2, Lesson 2.6, Activity 3, students develop and support an argument that gravity is a force exerted by the Earth and pulls people down toward Earth. Books: Which Way is Up? (Chapter 2)
5-PS3-1: Energy Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.	**Ecosystem Restoration** In Chapter 1, Lesson 1.4, Activity 2, students make models of animals by using interlocking cubes to represent matter. They use the models to construct the understanding of this process: when animals grow, they add more matter to their bodies, and that animals change the food molecules into molecules to build their bodies. In Chapter 1, Lesson 1.5, Activities 1 and 3, students use the Ecosystem Restoration Sim to investigate how animals use food molecules, then demonstrate their understanding with the digital Food Matter Model. In Chapter 1, Lesson 1.6, Activity 3, students write explanations about how animals in the rainforest ecosystem grow. In Chapter 1, Lesson 1.7, Activities 2-3, students enact an interactive model of a food web in the Everglades Swamp ecosystem, and trace the flow of food molecules back to plants. In Chapter 2, Lesson 2.1, Activity 3, students use the Sim to model and observe that plants create their food molecules using energy from sunlight, along with carbon dioxide and water. In Chapter 2, Lesson 2.2, students read Energy Makes It All Go. This nonfiction book describes plants, herbivores, carnivores, omnivores, and decomposers in an ecosystem, tracing the energy for each group of organisms back to the sun. In Chapter 2, Lesson 2.3, Activities 1-2, students play and discuss the Leaves and Roots game, which allows them to model how plants use carbon dioxide molecules and water molecules, along with energy from the sun, to make food

	the plants can use to grow. Then, in Activity 3, they use the Ecosystem Modeling Tool to demonstrate their understanding of where plants get their food molecules. In Chapter 2, Lesson 2.4, Activity 2, students use the Sim to gather evidence to evaluate claims about the question: Where does energy in an ecosystem come from? As they reflect on their evidence, students conclude that the claim, "Energy in an ecosystem can always be traced back to the sun," is supported by evidence. In Chapter 2, Lesson 2.5, Activities 2-3, students apply their understanding that energy in an ecosystem can be traced back to the sun as they work in small groups to create physical models that represent the path that energy takes through an ecosystem. Reflecting on the model, they observe that regardless of which path energy took through an ecosystem (through eating relationships), all of the paths trace back to the sun. The class posts the key concept: Energy in an ecosystem can always be traced back to the sun. Books: Energy Makes It All Go (Chapter 2)
5-LS1-1: From Molecules to Organisms: Structures and Processes Support an argument with evidence that plants obtain materials they need for growth mainly from air and water.	**Ecosystem Restoration** Chapter 2 begins with students asking a question: Why aren't the cecropia trees growing and thriving? In Chapter 2, Lesson 2.1, Activity 3, students use the Sim to gather evidence that plants use matter from air (carbon dioxide) and water from soil to make the food they need to grow. In Chapter 2, Lesson 2.2, students read Energy Makes It All Go. The book provides evidence that "plant food" and fertilizer aren't really food for plants — they're nutrients that help a plant grow better. To get the food they need to grow, plants take in carbon dioxide from air and water from soil and change the molecules into food they can use. In Chapter 2, Lesson 2.3, students use a model of photosynthesis — the Leaves and Roots game — to gather evidence about how plants use molecules from air (carbon dioxide) and water from soil, along with energy from the sun, to make the food they can use to grow. Students then use a digital app — the

	Ecosystem Modeling Tool — to create a model that demonstrates their understanding that plants make the food they need using air and water. In Chapter 3, students read A Walk in the Woods (Lesson 3.2) and conduct investigations in the Sim (Lesson 3.4, Activity 2) to understand that nutrients are important for plant growth because they help plants use water and matter from air to make food (as opposed to nutrients being a significant source of materials for plant growth). Books: Energy Makes It All Go (Chapter 2) A Walk in the Woods (Chapter 3)
5-LS2-1: Ecosystems: Interactions, Energy, and Dynamics Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	**Ecosystem Restoration** In Chapter 1, Lesson 1.3, students read Matter Makes it All Up which introduces the idea that matter moves through ecosystems. Using the model of an alligator in the Everglades Swamp ecosystem, the book follows how matter from what the alligator eats becomes part of its body as it grows and thrives in its environment. As matter is traced through the ecosystem, students learn that ecologists use food webs to model the movement of matter in an ecosystem from one organism to another. In Chapter 1, Lesson 1.6, Activity 2, students use a digital modeling tool to create a model that describes the movement of matter through an ecosystem. In Chapter 2, Lesson 2.3, Activity 3, students use the digital modeling tool to develop a model that shows the movement of matter from the environment (carbon dioxide from air and water from soil) to plants (producers). In Chapter 3, Lesson 3.2, students read Walk in the Woods, which follows a soil scientist who finds evidence of soil being formed from different kinds of matter, including through the process of decomposition. In Chapter 3, Lesson 3.7, Activity 1, students demonstrate the role of decomposers in a healthy ecosystem by creating a model that shows the flow of nutrients from decomposers into the soil, where they can be used by plants to help them use carbon dioxide and water to make food.

	Books: Matter Makes it All Up (Chapter 1) Walk in the Woods (Chapter 3) Restoration Case Studies (throughout the unit)
5-ESS1-1: Earth's Place in the Universe Support an argument with evidence that the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.	**Patterns of Earth and Sky** In Chapter 1, Lesson 1.4, Activities 2-4, students use the Sim to investigate the different relative distances from Earth of several stars including those in the Great Square of Pegasus. They then create a physical model of those distances in their classroom. They reflect on the varied but great distances to the stars. In Chapter 1, Lesson 1.5, Activity 3, students participate in a physical model where they measure objects representing the sun (a ball) and Sirius (a student's head) at different distances, concluding that other stars appear smaller than the sun because they are so much farther away. In Chapter 1, Lesson 1.6, Activities 1-2, students make sense of relative brightness and distance through a set of slides showing car headlights at different distances, the reference book, Handbook of Stars and Constellations, and a video of light pollution in various places to conclude that the sun looks much brighter than other stars because it is so much closer. Books: How Big is Big? How Far is Far? (Chapter 1) Handbook of Stars and Constellations (Chapter 1)
5-ESS1-2: Earth's Place in the Universe Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.	**Patterns of Earth and Sky** In Chapter 2, Lesson 2.2, Activities 2-3, students investigate the daily pattern of when the sun and other stars are visible in the Sim. They record data in a table and use it to understand the cause of this pattern. In Chapter 2, Lesson 2.3, Activity 1, students participate in the Mount Nose Model, in which their heads represent Earth, a ball represents the sun, and they consider what a person on top of Mount Nose (their noses) would see as

	Earth spins toward and away from the sun. In Chapter 3, Lesson 3.1, Activity 3, students use the Sim to observe the night sky throughout an extended period, recording data for dates that are 6 months apart. In Activity 4, they reflect on the data and draw conclusions about the seasonal appearance of stars. In Chapter 3, Lesson 3.2, Activities 2-3, students place constellation posters around the classroom to represent where the constellations are relative to the solar system in space. Students orbit a model sun as Earth and think about what constellations a person on Earth would or would not be able to see at different positions in Earth's orbit. In Chapter 3, Lesson 3.3, Activities 3-4, students choose a star to investigate in the Sim to figure out When it is visible in the night sky. The class comes together to map out which constellations are visible at different times of year. One student models Earth's orbit through a year. Books: Which Way Is Up? (Chapter 2) Dog Days of Summer (Chapter 3)
5-ESS2-1: Earth's Systems Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	**The Earth System** In Chapter 1, Lesson 1.3, students investigate how the biosphere and hydrosphere interact. In Activity 2, they create a diagram that shows why the people on one side of Ferris Island are running out of water while people on the other side are not. In Chapter 2, Lesson 2.3, Activity 4, students develop a model using The Earth System Modeling Tool to show how liquid water forms in the atmosphere. In Chapter 2, Lesson 2.3, Activity 3 and Lesson 2.4, Activity 1, students use The Earth System Sim to observe how water moves between the hydrosphere and atmosphere through condensation and evaporation.

	In Chapter 3, Lesson 3.1, Activity 3, the class creates a physical model to investigate what happens to water vapor at different heights and temperatures in the atmosphere. They then model their ideas about raindrop formation in the atmosphere in Chapter 3, Lesson 3.3, Activity, 2 using The Earth System Modeling Tool. In Chapter 4, Lesson 4.1, Activity 3, students use a physical model to investigate what happens when air hits an obstacle to figure out how wind and mountains interact. In Chapter 4, Lesson 4.1, Activity 2 and Lesson 4.2, Activity 1, students use The Earth System Sim to investigate and gather data about how the geosphere influences the movement of water vapor in the atmosphere, and how this can cause a rain shadow. In Chapter 4, Lesson 4.2, Activity 2, students make a model to describe how wind in the atmosphere and mountains in the geosphere affect the movement of water vapor, causing the rain shadow effect. In Lesson 4.4, Activity 3, students label a diagram with the interactions between the hydrosphere, biosphere, atmosphere, and geosphere on Ferris Island to describe the rain shadow effect and why East Ferris has a water shortage. Books: How the Earth System Explains Dinosaur Extinction explores the interactions among Earth's geosphere, atmosphere, biosphere, and hydrosphere that may have led to the extinction of the dinosaurs. (Chapter 4)
5-ESS2-2: Earth's Systems Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	**The Earth System** In Chapter 1, Lesson 1.1, Activity 4, students examine bar graphs in Water Encyclopedia that show how much water on Earth is saltwater and freshwater, the different sources of freshwater, and the different sources of surface freshwater to describe the distribution of water on Earth and explain that there is very little freshwater available for human use.

	Books: Water Encyclopedia describes the distribution of water on Earth in saltwater versus freshwater and explains how this distribution affects the ability of humans to use water for drinking. (Chapter 1)
5-ESS3-1: Earth and Human Activity Evaluate potential solutions to problems that individual communities face in protecting the Earth's resources and environment.	**The Earth System** In Chapter 1, Lesson 1.2, Activity 3, students read Water Shortages, Water Solutions, to obtain information about the causes of water shortages and examples of how people are addressing the issue. At the end of Chapters 2, 3 and 4, students design and iterate on freshwater collection systems as partial solutions to East Ferris's water shortage problem, applying what they learn in the unit to modify and improve their designs. In Chapter 5, Lesson 5.5, Activity 1, students read about wastewater treatment in Water Encyclopedia and combine information gathered with what they have learned about chemical reactions to explain how adding substances to wastewater allows engineers to get rid of harmful substances. In Chapter 5, Lesson 5.6, Activity 2, students participate in a Town Hall Meeting to discuss East Ferris's water shortage problem and possible solutions. This activity allows students to experience how a community comes together to discuss resource and environmental issues. Books: Water Shortages, Water Solutions (Chapter 1) Water Encyclopedia (Chapter 5)