Unit 1 - Sound Energy and What is Energy	Grade 4	Days - 17

Standards:
Students who demonstrate understanding can:
4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object. [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.]

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.]

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.]

4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.* [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]

Question:

- How does light, sound and energy travel and transfer through matter?

Essential Questions:

1. How can we explain the relationship between energy, forces, and matter?
2. How does understanding how sound travels impact our lives?
3. How is energy transferred?
4. What causes an object to be seen?

Enduring Understandings:

- Energy is transferred through matter.
- Energy can be transformed or changed from one form to another.
- There is a relationship between energy, forces, and matter.
- Sound waves have regular patterns of motions.
- An object can be seen when light reflected from its surface enters the eyes.

Storyline Narrative / Big Ideas:
Students will watch two different phenomena videos. One will be of popcorn kernels being popped using a popcorn machine. The second clip of a singer shattering a glass with his voice. Students will gather evidence from a range of activities to explain how the two phenomena occur. The scientific explanation behind both events include big science ideas around energy transfer and transformation. Throughout the unit, students should have opportunities to create and revise their own models of this popcorn popping and glass-shattering event; however, students should also apply what they understand about sound, heat and light energy to other phenomena relevant to their own lives. (Examples may include: loud airplanes flying over their neighborhoods, how guitars or other instruments work, or hearing loud music through walls from their sibling's/ neighbor's room.)

Vocabulary Words: speed, flow, form, frequency, force, reflection, vibration, absorb, cycle, decode, amplitude, wavelength

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
<u>Asking Questions and Defining Problems</u> Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3) **<u>Planning and Carrying</u>**	**PS3.A: Definitions of Energy:** The faster a given object is moving, the more energy it possesses. (4-PS3-1) Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3) **PS3.B:**	**Energy and Matter -** Energy can be transferred in various ways and between objects. (4-PS3-1),(4- PS3-2),(4-PS3-3),(4-PS3-4) **Patterns** - Similarities and differences in patterns can be used to sort and classify natural phenomena. (4-PS4-1) Similarities and differences in patterns can be used to sort and classify designed products. (4- PS4-3) **Cause and Effect -** Cause and effect relationships are routinely identified. (4-PS4-2)

<u>Out Investigations</u> Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K– 2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2 **<u>Constructing Explanations and Designing Solutions</u>** Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1) Apply scientific ideas to solve design problems. (4- PS3-4) **<u>Developing and Using Models</u>**	**Conservation of Energy and Energy Transfer:** Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2),(4-PS3-3) Light also transfers energy from place to place. (4-PS3-2) Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2),(4-PS3-4) **PS3.C:**	

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4- 1) Develop a model to describe phenomena. (4-PS4-2)	**Relationship Between Energy and Forces:** When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3) **PS3.D: Energy in Chemical Processes and Everyday Life:** The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) **ETS1.A: Defining Engineering Problems:** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.	

	(secondary to 4-PS3-4) **PS4.A: Wave Properties:** Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (Note: This grade band endpoint was moved from K–2.) (4-PS4- 1) Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1 **PS4.B: Electromagnetic Radiation:** An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) **PS4.C: Information Technologies and Instrumentation:** Digitized	

	information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3) **ETS1.C: Optimizing The Design Solution:** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (secondary to 4-PS4-3)	

Consolidated Supply List:

- Ice Tray,
- Paper cups
- String
- Paper clips
- Construction paper
- Flashlights
- Marbles of all sizes
- Measurement stick
- Mystery Science subscription
- Brainpop subscription

Episode 1
Engage/Elicit Ideas
Days - 2 days

Lessons	**Resources**
Lesson 1: Phenomena Heat/Energy Transfer **Gather** - Ask students - How does energy travel and transfer	**Lesson 1:** ● Phenomena

through matter? Show phenomena video and elicit initial ideas. (If you have a popcorn maker you can also do this phenomena live in the classroom). Have students complete a T-Chart in their science notebooks. What observations did you make? What questions do you have? **Reason** - Have students draw a model of what they saw in the video of How they think light, sound and energy travel and transfer through matter. in their science journals. Point out what makes a good science model - labels, pictures, arrows, etc. **Communicate -** Class Discussion - Share their noticings and wonders. -How is energy being transferred in the system? **Lesson 2: Phenomena Sound Energy** **Gather** - Ask How does sound and energy travel and transfer through matter? Elicit ideas - Show phenomena video of a time lapse and elicit initial ideas. **Reason** - Have students draw a model of what they saw in the video of how sound and energy travel and transfer through matter. Point out what makes a good science model - labels, pictures, arrows, etc. You can also have students fill out the graphic organizer for their model. Students write down their noticings and wonders about the phenomena. **Communicate -** Class Discussion - Share their noticings and wonders. ○ What do you see? What do you hear? ○ What happens at the beginning, middle and end? ○ What do you predict if the singer was farther away? Or didn't sing as loud? ○ What's going on here that you can't see but you might think is happening?	• *Popcorn Maker Link* **Lesson 2:** • Phenomena - Jaime Vendera- Shatter a glass with your voice- Link • Graphic Organizer link
Episode 2 **Explore** **Days: 6 days**	
Lessons	**Resources**
Lesson 3: Heat Energy Transfer **Gather -** Students can make a prediction in their science notebooks. Will an ice cube melt faster when placed directly on a counter top or when it is placed on a towel? Students should then decide how they are going to measure and collect data for the experiment in their notebooks or use the provided graphic organizer. Possible student suggestions:	**Lesson 3:** • Ice Tray for making ice cubes • Towel • Graphic Organizer- How will you collect

1. Measure the size of the ice cube over time 2. Observe the amount of water the ice cube produces as it melts 3. Feel the temperature of the icecube over time Students can perform the experiment based on their decision on how to collect data. **Reason -** Students should draw a model of their ice cube at different stages. Students can reflect on their hypothesis. Use the Cause and Effect template to record observations - CauseandEffectPrimaryGraphicOrganizer **Communicate -** Discuss the following questions as a class. ● *How does the heat energy move between the two systems?* ● *Why do ice cubes melt faster when directly on the countertop than on the towel?* ● *Why does it take energy to change an ice cube into liquid water?* ● *How does the evidence you collected support your explanation of energy transfer through the popcorn machine?*	data? **Lesson 4:** ● Data recording sheet **Lesson 7:** ● Mystery Science - How far can a whisper travel? ● Paper cups
Lesson 4: Human Voices **Gather -** Tell students that today they will be exploring the question, “How do we make different sounds with our voices?”. **Reason -** Students will then conduct the experiment, “Human Voices” and fill out the data recording sheet. Data recording sheet Chart out their ideas and patterns on chart paper. Have students answer the questions at the bottom of the data recording sheet. **Communicate -** Discuss the following the questions as a class: 1. What can you tell us about vibrations and sound that you learned today? 2. How is that like what happens with the singer as he shatters the glass? 3. How does today’s lesson help us understand what’s going on inside the singer’s body that we can’t see that helps him be able to shatter the glass?	
Lesson 7: Mystery Science: How far can a Whisper Travel? **Gather -** Watch the Mystery Science video- How far can a whisper travel?	

Reason - Students will perform the experiment. In the experiment students will create paper telephones in order to identify how energy is transferred between matter. Students can use the data recording sheet to record their observations. **Communicate -** Writing Reflection - Answer the prompt below. How did the sound travel from one cup to another?	• String • Paper clips • Data recording sheet
Lesson 8 - What Color is That? **Gather-** Prep your room for this experiment. Use black plastic and tape to get your classroom totally dark Or use a room in the school that does not have any windows. Students will try to identify color in the dark. **Reason-** Use sheets of colored construction paper and have students try to identify the color in the dark. Put a number on each sheet so students need to identify the color and the number. Use different sources of light, face the light away from and directly at the colored paper. Allow students to determine the means needed to see the colored paper directly. Students will collect data as to which source is more efficient to see. **Communicate -** Students **construct an explanation** and **develop a model** for the causes of objects only being able to be seen when light is reflected off of them. (*Students' models should simply show light being reflected from objects and entering the eye.)* Use lines, rays or angles to show reflections. *Questions to initiate Discussion:* *Q: How do we see things in the dark?* *Q: What caused the object to be seen?* *Q: Why can we see the objects when there is more light in the room?* *Q: When were you able to see the object more clearly?* *Q: What is the source of light and the path of the light that you could see?* *Q: Where does the light come from that lets us see the moon?*	**Lesson 8:** • Construction paper • Flashlights
Lesson 9: Colliding Marbles **Gather** - Ask students - What do you think happens with energy when objects collide. Explain to the students that today we will be experimenting with marbles to answer questions about what happens when these collisions occur.	**Lesson 9:** • Marbles of all sizes • Measurement stick

Reason - Students will complete the Marble Lab below. Students will record their measurements and observations. Marble_lab.doc **Communication** - Bring the class back together: ● Use the data table to ask distance comparing questions using the measurements. ● Encourage students to use their own words to describe their findings about each group of marbles. ● Briefly lead a class discussion about Newton's Laws of Motion - Teacher info - What Are Newton's Laws of Motion? **Lesson 10: Seeing Sound - Wavelength and Aptitude** ******View and use lesson to prepare - Anchoring Phenomena with Mystery Science **(Only do the Anchor Phenomena and Guided Activity)** **Gather** - Students are introduced to the unit anchoring phenomenon, a music video by composer Nigel Stanford, that showcases a series of devices that make sound waves visible. **Reason** - In the activity, students will create an initial conceptual model to explain how each device works. Students will revisit their model after each Mystery to add new information to it. Use the Seeing Sound Packet to record findings. **Communicate** - Share their findings with the class.	**Lesson 10:** ● Seeing Sound Packt (in lesson) ● Mystery Science Lesson - Anchoring Phenomena with Mystery Science
Episode 3 **Explain** **Days: 5 days**	
Lessons	**Resources**
Lesson 11:- Vocabulary Splash **Gather** - display all the unit's vocabulary words on the board. Read each word to the class with a brief explanation of the words. **Reason** - partners sort these words in an open sort using their prior knowledge. Label each group of words. **Communicate** - share how they sorted these words to the class.	**Lesson 11:** ● Vocabulary Words: speed, flow, form, frequency, force, reflection, vibration, absorb, cycle, decode,amplitude, wavelength

	• Sentenc e strips or digital
Lesson 12: What is Sound? **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Explain to students that they will be watching a Brainpop Video on sound and reading Pitch, Frequency, Volume Article. They will be using the information from what they learn in both the video and text to fill out a graphic organizer. **Reason -** Watch the video as a class and pause at the listed times to ask students the Guided Video Questions. Some of the questions will also have students defining key vocabulary terms. You can then have students work in pairs or individually to complete the reading and the graphic organizer. **Communicate -** Students will use the information they learned from the videos and worksheet to explain how they felt a different strength of vibration during the humming experiment. Students will add or edit their models from the beginning of the unit to show how the singer was able to shatter the glass with their voice.	**Lesson 12:** • Brainpop Video • Guided Video Questions • Pitch, Frequency, Volume Article • Graphic Organizer
Lesson 13: Light Energy **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Explain to students that today they will be reading an article on light reflection. Have students think back to the light experiment and share out their ideas on how light travels/how we are able to see things in the dark. **Reason -** Students should read through the Generation Genius article on light reflection. And watch this brief video How Do Your Eyes See Color? *(Optional: they can also read the article Reflection and Refraction and fill out the venn diagram.)* After reading the article in their science notebooks, students Develop a model to describe how light reflecting from objects and entering the eye allows objects to be seen. (Math Connection - they should use rays, lines, arrows, and/or angles to show light reflection). **Communicate:** Discuss the following questions as a class.	**Lesson 13:** • Generation Genius article on light reflection. • Video - How Do Your Eyes See Color? • *Reflection and Refraction*

Students can also share their models from their notebook. 1. How is the human eye able to see light? 2. Why do some objects reflect light better than others? 3. Name a real life example of light reflection. Quick Write - students write how light reflecting from objects and entering the eye allows objects to be seen. **Lesson 14 - Sound Patterns that Provide Information** **Gather** - Students watch video all about Morse Code Invention of Morse Code **Reason** - Students learn some basic words with the teacher and then create their own word/message using the chart of the dits and dahs alphabet chart in the resource below. Model one for the class and then have students create their own. Resource: https://www.wikihow.com/Learn-Morse-Code **Communicate** - students share their morse code and then students guess what they wrote. **Lesson 15: Types of Energy** **Gather** - There are many types of energy. Today you will research one type of energy with a group of students and share your knowledge about it. Heat, Light, Sound, Electrical, Sound, Split class up into 5 groups. **Reason** - Students will use resources like Epic, Newsela or ReadWorks to research their topic, Students must use two resources to learn about their topic. They will then put together a SlideShow to share with the class.. **Communicate** - Share their knowledge to the class. Teacher uses rubrics to grade presentations. 4thGradePresentationRubric	**Lesson 14:** • Video - Invention of Morse Code • Morse code resource - https://www.wikihow.com/Learn-Morse-Code
Episode 4 **Elaborate/Build New Content/Apply new Content** **Days: 2 days**	
Activity	**Resources**
Design Lesson - https://mysteryscience.com/waves/mystery-4/sound-waves-engineering/235 **(Hands on Activity from the Mystery Lesson)** **STEM Project: Create a Sound** **Day 1: Planning** Tell students that they will be creating an instrument that will need to produce a sound. First they will decide what pitch they will want	

their instrument to make, either high or low. Next, using what they know about pitch, volume, wavelength they will design an instrument that will make that pitch. Make sure to provide students with a supply list of materials before they design their instrument. Their design should have labels using the vocabulary terms they have learned throughout the unit. **Day 2: Construction** Students will gather the supplies needed and use their plan to create their instrument. Once students are done creating their instrument it will be time to test it out in front of their peers. **Alternative STEAM Challenge:** **Create a Soundproof Room** Students will be tasked with creating a soundproof room. The teacher can use a free tone generator on their phone and create a sound in a cardboard box. On their computer they can use a sound meter https://webbrowsertools.com/sound-meter/ to record the sound. That is the control sound. Students will try to create a soundproof room using a cardboard box and materials in the classroom (paper, craft sticks, felt, cardboard, ect) to make the sound from the phone softer when in their box. If the sound meter reads lower they have beaten the control sound. You can have students test and improve several times to keep getting the sound softer.	
Episode 5 **Evaluate** **Days: 2 days**	
Assessment	**Resources**
Sound Energy Assessment: mystery-science (1).pdf	
Common Core State Standards Connections:	
ELA/Literacy – • RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1) • RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4- PS3-1) • RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1) • W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1) • W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2),(4-PS3-3),(4-PS3-4) • W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4) • W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1)	

- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-1),(4-PS4-2)

Mathematics –

- 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (4-PS3-4)
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-1),(4-PS4- 2)

Instructional Strategies: Supports for English Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects (realia)	Charts	In pairs or partners
Manipulatives	Graphic organizers	In triads or small groups
Pictures & photographs	Tables	In a whole group
Illustrations, diagrams, & drawings	Graphs	Using cooperative group
Magazines & newspapers	Timelines	structures
Physical activities	Number lines	With the Internet (websites) or software programs
Videos & films		In the home language
Broadcasts		With mentors
Models & figures		

Differentiation Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/ expectations
Repeat/confirm directions	Increase task structure (e.g., directions, checks for understanding, feedback)	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding (e.g., writing, reading aloud, answering questions in class)	Individualized assessment tools based on student need
Audio Books	Utilize prereading strategies and activities: previews, anticipatory guides, and semantic mapping	Modified assessment grading

Unit 2: From Molecules to Organisms	Grade 4	Days - 18

Standards:
Students who demonstrate understanding can:
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]

4-LS1-2. 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. [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

Anchoring Question:

- How do plants and animals use their internal and external structures for survival, growth, and reproduction?

Essential Questions:

1. How does an organism's structure fit its function?
2. How do structures support the survival of plants and animals?
3. How are instincts and learned behaviors beneficial to organisms?
4. How do senses function to help an animal's survival?

Enduring Understandings:

- Animals respond to different types of information through their senses (smell, touch, taste, hear and feel) to help them survive.
- There are internal and external factors that affect human, plant, and animal processes of survival.
- Instincts and learned behaviors are beneficial to organisms.

Storyline Narrative / Big Ideas:
In this unit, students begin by watching a video of a wilted tomato plant "coming back to life." Students conduct investigations on plant and animal structures, animal adaptations, and animal senses. In the explained episode, students will watch videos and read texts about plants and animals' various internal and external structures that support survival, growth, and reproduction. They will also learn how animals use their senses for survival and how plants and animals adapt to improve their chances of survival. The unit will culminate with students creating their own animal or plant and describing how its internal and external structures help it to survive, grow, or reproduce. Students will take a final assessment by looking at pictures of animals and plants and identifying the external and internal structures and how it helps the animal survive, grow, or reproduce.

Vocabulary Words: internal structure, external structure, adaptation, senses, behavior, instinct, stamen, pistil, pollination, reaction, xylem, phloem, brain, neurons, reproduce

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
<u>Developing and Using Models</u> Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) **<u>Engaging in Argument from Evidence</u>** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). Construct an argument with evidence, data, and/or a model. (4-LS1-1)	**LS1.D: Information Processing:** Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. **LS1.A: Structure and Function:** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	**Systems and System Models -** A system can be described in terms of its components and their interactions. (4-LS1-1),(4-LS1-2)

Consolidated Supply List:

- *Feathers: Not just for flying* by Melissa Stewart
- 2 White Carnation Flower,
- 2 Clear Drinking Glasses
- Red and blue food coloring
- Celery stalks with leaves still attached
- Glass/vase/beaker
- 16 oz. clear plastic cups
- cotton balls
- Essential Oils
- Small cups
- Box of breakfast cereal
- Wooden craft sticks
- Cookie sheets or cafeteria trays
- Plastic wrap
- Paper plates

• Marbles • Raisins • Small bits of sponge • drinking straws • Clothespins • metric ruler • Book **-** Feathers: Not just for flying by Stewart, M. • Mystery Science subscription • Brainpop subscription • Epic Book subscription • Newsela subscription	
Episode 1 **Engage/Elicit Ideas** **Days: 1 day**	
Lessons	**Resources**
Lesson 1: Phenomena - Wilted Plant Recovers **Gather -** Tell students you will be showing them a time-lapse video of a tomato plant that was very dry. Show students the video of the tomato plant recovering. **Reason -** Students will write down 10 notice and wonder statements in their notebooks and share these ideas with a partner or small group. Students will then draw a model to explain how the tomato plant came "back to life." **Communicate -** Gather the class back together for a whole class discussion. On chart paper, create a class model of how the tomato plant came back to life.	**Lesson 1:** • Video Link: *Engage Tomato Plant*
Episode 2 **Explore** **Days: 5 days**	
Lessons	**Resources**
Lesson 2: Color Changing Celery Part 1 (Structure And Survival) **Note To Teachers: 24-48 hours before this lesson, be sure to put a white carnation in a plastic cup with food coloring. You will be using it as a model before students conduct their investigation with the celery stalks.** **Gather -** Show students the white carnation that has been in the food coloring for 24 hours. • Ask: How do you think the color from the water got to the petals?	**Lesson 2:** *For Teacher Demo* • 2 White Carnation Flowers • 2 Clear Drinking Glasses • Water • Red Food Coloring *For Student Investigation* • Celery stalks with

• Explain that they will be conducting their own investigation using celery stalks and food coloring. • Split students into small groups or partners. Students will place the celery into the food coloring. **Reason -** Students draw models of what their celery looks like now and write down their hypotheses about what will happen to the celery after 24 hours. Have each team draw a model of their prediction on chart paper. Use guided questions to help them make their models as detailed as possible like: • What plant parts have you included in your model that you would not be able to see if you were looking at the plant growing in the ground? • How do you think the plant will change by tomorrow? • How does your model show and explain your predicted changes? • Can you use arrows to show how the changes will take place over time? • Which parts of the plant do you think will work together in order for your predicted changes to happen? **Communicate -** Students do a gallery walk and look at each other's models. **Lesson 3: Observe Celery Part 2 (after 24 hours) (Structure And Survival)** **Gather**- Students observe the celery from the previous lesson and notice what changes occurred. Ask students - How do you think this happened? **Reason-** Instruct students that they will examine a section of the celery. Students will break the celery in half. (See the video under resources to help with this step). They will observe the internal structure of the celery stem. Then students will add the structures they think are inside the celery's stem to their models that caused the plant to move the water. **Communicate-** Students do a gallery walk of their revised models and place questions or comments on each other's model with sticky notes. How does this help a plant survive, grow and reproduce? **Lesson 4: The Nose Knows (Senses)**	leaves still attached (will not work with leafless stems), one stalk per team • Red and blue food coloring • Glass/vase/beaker/16 oz. clear plastic cup large enough to hold a celery stalk, one per team • One piece of chart paper per group *Teacher Resource:* Video that explains what happens to celery **Lesson 3:** • *Teacher Resource:* Video that explains what happens to the celery • Celery stalks with food coloring after 24 hours **Lesson 4:**

Gather - Ask - How do you think an animal finds food? Explain the directions for the activity - "The Nose Knows" Activity. Give each student a cotton ball with their scent and tape it to their shoulder.

Reason - Students walk around sniffing each other's cotton balls, trying to find their matching scent. Once all students have found their match, students will write their conclusions of "How do you think animals use their sense of smell to help them survive, grow and reproduce?"

Communicate - Come together as a whole class and share their experiences with the activity and possible answers to the question about animals' sense of smell. Watch Video on "The Nose Knows"

Lesson 5: Feeding Frenzy (Animal Adaptations)

Note To Teachers: This investigation asks students to eat certain foods. Instead of having students eat the food, have them just pick up the food.

Gather -

- Conduct the "hook" part of the lesson by giving each student a small cup of cereal. First have them pick up cereal with their fingers and then have them try to gather cereal with the popsicle stick. What happened?
- Bring students together and define "adaptation" and how different animals have developed different mouth parts to eat certain foods.

Reason - In either small groups or as a whole class, conduct the investigation - activity . The different materials represent animal mouth parts and animal food.

- Students try to gather as much "food" as they can with their assigned "mouth part." See pages 3-5 of the activity for more detail.
- Students should record their findings after the investigation. Print pages 8-10 from the activity so that students can record their findings.

Communicate - In their science journals choose one of the questions to respond to:

- Experiment - "The Nose Knows" Activity
- Video on "The Nose Knows"

Materials:

- Cotton balls (one for each student)
- Tape (or cups for each student's cotton ball)
- Essential Oils
- Recording sheet to keep track of which students has which oil

Additional resources:

- Short Wild Kratts video on animal scent

Lesson 5:
Experiment and recording sheet - Feeding Frenzy

Materials:

- "What's in Your Mouthpart?" handout for each student
- "Feeding Frenzy" activity sheet for each student
- Small cups
- Box of breakfast cereal
- Wooden craft stick for each student
- Cookie sheets or cafeteria trays
- Water
- Plastic wrap
- Rubber bands
- Sheets of thin paper
- Paper plate
- Marbles
- Raisins
- Small bits of sponge
- Plain drinking straws
- Drinking straws cut diagonally to create a pointed tip
- Clothespins

• Which insects were the most successful with what food sources? Why? • Were any insects able to get nourishment from more than one food source? Why? • Do they think that some insects are adapted to eat a larger variety of foods than others? **Lesson 6: Reaction Time (Instincts and Learned Behaviors)** *Mystery Science Investigation Human Machine Unit* *Lesson 4 of 4- How does your brain control your body?* **Gather -** Conduct the "exploration" part of the Mystery Science video. Play through each slide, and stop and discuss where the video indicates. Continue onto the "hands-on activity" portion of the video and answer any questions about the directions. **Reason** - After students conduct the investigation in their small groups, ask students to answer the follow questions from step 10 of 10 from the Mystery Science slides in their science notebooks: • What, if anything, surprised you about this investigation? • What changes did you notice as you repeated the experiment? • Can you explain those changes? **Communicate -** Students come back to the whole group and share what they learned. Play the final video from Mystery Science.	• Scissors • Paper towels **Lesson 6:** • **Mystery Science** How does your brain control your body? Materials • Metric ruler, one per pair • Blank piece of paper (one per student) • Data Table (can be found from Mystery Science link under
Episode 3 **Explain** **Days: 7 days**	
Lessons	**Resources**
Lesson 7:- Vocabulary Splash **Gather** - display all the unit's vocabulary words on the board. Read each word to the class with a brief explanation of the words. **Reason -** partners sort these words in an open sort using their prior knowledge. Label each group of words. **Communicate** - share how they sorted these words to the class.	**Lesson 7:** • **Vocabulary words** - internal structure, external structure, adaptation, senses, behavior, instinct, stamen, pistil, pollination, reaction, xylem, phloem, brain, neurons, reproduce • Sentence Strips of vocab words or display digitally

Lesson 8: Plant Growth(2 days) **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Explain to students that they will be watching two Brain Pop videos on parts of a plant and plant growth. They will be using the video to gather information about the different parts of plants and each part's function. If the Brain Pop Jr. video seems too basic, you can have students skip right to the plant growth video. **Reason -** Students will take notes from each video using the note-taking template provided or their own note-taking structure of choice (Note-taking template) and then label parts of a plant (not flower) on this model. PartsofaPlantandFlowerLabellingWorksheet **Communicate -** Students will use the information they learned from the videos and plant structure worksheet to explain how the celery changed color in the investigation from lessons 1 and 2 of the "explore episode." Students will add or edit their models from the beginning of the unit to show structure. They will use arrows, labels, vocabulary words and color. .	**Lesson 8:** ● Videos - Brain Pop Jr. Video- Parts of a Plant and Brain Pop Video- Plant Growth ● Parts of Plant - PartsofaPlantandFlowerLabellingWorksheet ● Note-taking template Additional resources: ● Video explaining celery food coloring investigation
Lesson 9: Animal Structures- Feathers **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Either use the video link on the right or read the hard copy version of the book *Feathers: Not Just for Flying* by Melissa Stewart. **Reason -** Students fill out the read aloud note-taking chart that explains how each bird uses its feathers for survival, growth, or reproduction. This can be done while the teacher does the whole class read aloud, or if you are showing the read aloud on video, students can do this independently or in pairs. **Communicate -** Create a whole class chart on chart paper and have each student/partnerships fill in part of the chart.	**Lesson 9:** ● Read Aloud - Feathers- Not Just for Flying Read Aloud or Hard copy version of book: Stewart, M. (2014). Feathers: Not just for flying. ● Read aloud note-taking chart
Lesson 10: Wild Kratts Videos on Night	**Lesson 10:** ● Wild Kratts Link (just use the

Primates **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Play the Wild Kratts videos on night primates and eye adaptations. The first link is the clips that talk specifically about night vision,and the second link is the full episode. **Reason -** In their science notebooks, students make observations of how primates see at night. Why is this an important skill for survival? **Communicate -** At the end of the episode, students gather in partnerships or small groups to compare their notes. Gather as a whole class to ensure students understand how animals use internal and external structures and senses to survive in the dark in order to survive. **Lesson 11: Animal Adaptations- Instincts & Learned Behaviors** **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Watch this video on instincts and learned behavior. Then, ask students to choose 2 of the 4 Newsela articles (listed to the right) to read about animal behaviors. **Reason -** For each article, ask students to list out the animal behaviors as instincts or learned behaviors and how it helps the animal to survive, grow, or reproduce. **Communicate** - Students should share their findings with a partner or small group. Students who read the same articles should compare their findings. **Lesson 12: Human Brain Reading & Interactive Activities** **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Read *The Brain* by Ben Williams on Get Epic. Students can read this independently, or the teacher can do a whole class read aloud.	night primates and eye adaptations videos) and • Wild Kratts Googly Night Eye Guru Episode 39 Full Episode **Lesson 11:** • Video on instincts and learned behaviors • Newsela articles on animal behaviors: Newsela Article #1 Newsela Article #2 Newsela Article #3 Newsela Article #4 **Lesson 12:** • The Brain by Ben Williams (Time For Kids version- available on Get Epic) • The Franklin Institute Interactive Brain Activities

Reason - Students will try out some of the interactive brain activities on The Franklin Institute's website. Students will use what they learned in the reading to help explain what is happening in the activities. Each activity is also accompanied by an explanation. **Communicate** - In their science notebooks, students will choose one of the activities to focus on and write down what they learned about how their brains functioned during that activity.	
Episode 4 **Elaborate/Build New Content/Apply new Content** **Days: 3 days**	
Activity	**Resources**
Project- "Create-a-plant" or "Create-an-animal": • Use the link as a resource to provide students with the directions and planning pages. Students will create their own plant or animal and identify at least 3 external and internal structures that help the plant/animal to grow, survive, or reproduce. See the samples in the link. • Then write a CER essay (pg. 16 for instructions)	• Directions and Planning Templates
Episode 5 **Evaluate** **Days: 2 days**	
Assessment	**Resources**
Lesson 14: Assessment: What's Your Evidence? Tell students: "You are going to use what you have learned to construct an evidence-based argument defending the claim that a specific plant or animal uses internal and external structures to support survival, growth, reproduction, and behavior." Students will choose one plant and/or one animal from the series of slides linked to the right. Students will then use the planning templates to construct their arguments. Students can peer review each other's arguments and provide feedback to improve each other's pieces.	• What's Your Evidence Slides • Planning Template- Animals • Planning Template- Plants • Rubric
Common Core Curriculum Connections:	
ELA/Literacy –	

- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)

Mathematics –

- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line symmetric figures and draw lines of symmetry. (4-LS1-1)

Instructional Strategies: Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects (realia)	Charts	In pairs or partners
Manipulatives	Graphic organizers	In triads or small groups
Pictures & photographs	Tables	In a whole group
Illustrations, diagrams, & drawings	Graphs	Using cooperative group
Magazines & newspapers	Timelines	structures
Physical activities	Number lines	With the Internet (websites) or software programs
Videos & films		In the home language
Broadcasts		With mentors
Models & figures		

Differentiation Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/ expectations
Repeat/confirm directions	Increase task structure (e.g., directions, checks for understanding, feedback)	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding (e.g., writing, reading aloud, answering questions in class)	Individualized assessment tools based on student need
Audio Books	Utilize prereading strategies and activities: previews, anticipatory guides, and semantic mapping	Modified assessment grading

Unit 3: Earth's Systems and Earth's Place in the Universe	Grade 4	Days - 19

Standards:
Students who demonstrate understanding can:
4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. [Clarification Statement: Examples of evidence from patterns could include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.]

4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.
[Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]

Anchoring Question:

- How is Earth's structure continuously changing over time?

Essential Questions:

1. What do the shapes of landforms and rock formations tell us about the past?
2. How can models be used to understand interactions on earth?
3. How has the Earth changed over time?
4. How does the past help us predict the future?

Enduring Understandings:

- Physical and chemical principles are unchanging and drive both gradual and rapid changes in the Earth system.
- Models help us understand change over time.
- Physical and chemical cycles on Earth (water, weather, erosion, etc) drive both gradual and rapid changes of the earth's landforms.

Storyline Narrative / Big Ideas:
In this unit of study, students develop understandings of the effects of weathering and the rate of erosion by water, ice, wind, or vegetation. The crosscutting concepts of patterns and cause and effect are called out as organizing concepts. Students demonstrate grade-appropriate proficiency in planning and carrying out investigations and constructing explanations. Students are also expected to use these practices to demonstrate understanding of the core ideas.

Vocabulary Words: earthquake, erosion, history, planet, surface, canyon, fossil, layer, collide, cycle, properties, valley, volcano, weathering, deposition		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Cross Cutting Concepts**
<u>Planning and Carrying Out Investigations</u> Planning and carrying out investigations to answer questions of test solutions to problems in 3-5 builes on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (4-ESS2-1 **<u>Analyzing and Interpreting Data</u>** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2) **<u>Constructing Explanations and Designing Solutions</u>** Constructing explanations and designing solutions in 3– 5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to	**ESS2.A: Earth Materials and Systems:** Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms and gravity break rocks, soils and sediments into smaller particles and move them around. (4-ESS2-1) **ESS2.B: Plate Tectonics and Large-Scale System Interactions:** The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2) **ESS2.E: Biogeology:** Living things affect the physical characteristics	**Cause and Effect -** Cause and effect relationships are routinely identified, tested, and used to explain change. (4-ESS2-1) **Patterns** - Patterns can be used as evidence to support an explanation. (4-ESS1-1)

design problems. Identify the evidence that supports particular points in an explanation. (4-ESS1-1)	of their regions. (4-ESS2-1) **ESS1.C: The History of Planet Earth:** Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)	

Consolidated Supply List:

- Sugar Cubes
- Plastic container with lids
- Paper plates
- Skittles
- Water Droppers
- Cups
- Food coloring
- Ziploc bag bags
- Paper Confetti
- Rocks
- Red Marker
- Book: “Fossils Tell of Long Ago” by Aliki Brandenberg
- Book: “Weathering and Erosion” by Maloof Torrey
- Mystery Science subscription
- Epic Book subscription

Episode 1
Engage/Elicit Ideas
Days: 1 day

Lessons	Resources
Lesson 1: Phenomena **Gather** - Elicit ideas - Show phenomena video of a time lapse and elicit initial ideas. Have students draw a model of what they saw in the video in their science journals. Point out what makes a good science model - labels, pictures, arrows, etc. **Reason** - Students write down their noticings and wonders about the phenomena.	**Lesson 1:** ● Phenomena- Video Link ● Journal/notebook ● Noticing and Wonders pdf - link

Communicate - Class Discussion - Share their noticings and wonders. Create a KWL. - How did Peru's river change over time? - What do you think caused the Earth's surface to change over time? - Do you think that Peru's river is still changing shape?	
Episode 2 **Explore** **Days: 8 days**	
Lessons	**Resources**
Lesson 2: Will a Mountain Last Forever? Mystery Lesson- Link **Gather -** Watch the Mystery Science - The Birth of Rocks **Reason** - Students will perform the experiment. In the experiment students will shake sugar cubes in a container and notice how the sugar cube becomes round as it hits the walls of the container. Students will record their noticings in the data recording sheet. **Communicate** - Students reflect on their new learning from this experiment by answering the questions at the bottom of the data recording sheet. **Lesson 3: Skittles Water Erosion Experiment** **Gather -** Students pour water on skittles to demonstrate erosion of the color and the layers. **Reason** - Students draw a model and describe what is happening to the skittles on the data recording sheet. Students answer the questions on the data recording sheet to relate the parts of experiment to how erosion shapes the Earth. **Communicate -** Class discussion: Think back to the phenomena video we watched at the start of the unit. How does your data from this experiment relate to the way the shape of Peru's river changes over time? **Lesson 4: Could a Volcano Pop Up in your Backyard?** **Gather -** Watch the Mystery Science- Could a Volcano Pop Up in your Backyard? Link	**Lesson 2:** ● Lesson - Link ● Data recording sheet or link ● Markers ● Sugar Cubes ● Plastic container with lids ● Paper plates **Lesson 3:** ● Data recording sheet ● Skittles ● Water ● Water Dropper ● Cup **Lesson 4:** ● Lesson - Mystery Science: Can a Volcano Pop Up in your Backyard? ● Worksheets - mystery-science (1).pdf ● Red marker,crayon, or colored pencil

Reason - Students perform the activity from Mystery Science. In groups they will map out where volcano locations are around the world. Students will discover and learn that volcanoes are most likely to appear in the ring of fire. **Communicate**- As a class discuss the following questions: 1. Looking at the data from the experiment do you think it is possible that a volcano can pop up in New Jersey? 2. Think back to the first Mystery Science, “Will a Mountain Last Forever?”. How do you think New Jersey's land has changed over time?	
Lesson 5: Wind Erosion and Weathering Lab **Gather** - Ask the students to think about the wind. How does the wind affect us? What things are carried by the wind? **Reason** - Students will perform the wind erosion lab. In this lab students will blow on paper confetti holes using a light breeze and a strong breeze. Students will then add rocks to the bin and repeat the same steps.Students will answer the post lab questions and as a class discuss their noticings. **Communicate** - Students will write a reflection in their notebooks comparing/contrasting wind and water erosion/weathering.	**Lesson 5:** ● Lesson - Wind Erosion and Weathering Lab ● Paper confetti ● Rocks ● Plastic bin
Lesson 6: Fossils **Gather** - Ask students what their explanation is for what killed the prehistoric animals, how their bones ended up underground, and what changes happened to the land that uncovered their fossils. Watch the intro. video - Anchoring Phenomena **Reason** - Students generate observations and questions about the phenomenon and create an initial explanation to explain what killed the prehistoric animals, how their bones ended up underground, and what changes happened to the land that uncovered their fossils. **Communicate** - Use a cause and effect diagram to show understanding of water erosion, wind erosion, fossils, weathering - CauseandEffectTemplate	**Lesson 6:** ● Worksheet - See-Think-Wonder ● Worksheet - Ashfall Fossil ● Lesson - link

Episode 3 **Explain** **Days: 7 days**	
Lessons	**Resources**
Lesson 7:- Vocabulary Splash **Gather** - display all the unit's vocabulary words on the board. Read each word to the class with a brief explanation of the words. **Reason -** partners sort these words in an open sort using their prior knowledge. Label each group of words. **Communicate** - share how they sorted these words to the class. **Lesson 8: Identify the Different Types of Erosion** **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather** - Split students into groups and assign each group a different form of erosion. Have students become an expert on that form of erosion and prepare to teach the rest of the class. -Link **Reason** - Groups take turns teaching their type of erosion to the class. Students can take notes in their science notebook or use the guided notes worksheet. -Link **Communicate -** Share their knowledge. Then as a class, discuss the difference between the types of erosion and think of examples where they have seen the different types in their own lives. Teacher can chart out the real life examples. **Lesson 9: Read Aloud Weathering and Erosion** **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Read aloud the book Weathering and Erosion on Get Epic - link **Reason -** Students can fill out the note-taking chart while you are reading the book aloud to them. You can help	**Lesson 7:** ● Vocabulary - earthquake, erosion, history, planet, surface, canyon, fossil, layer, collide, cycle, properties, valley, volcano, weathering, deposition **Lesson 8:** ● Erosion Readings ● Guided Notes **Lesson 9:** ● Get Epic: Weathering and Erosion ● Note Taking Chart

students define weathering and erosion. Next, students will have to describe how different agents aid weathering and erosion. **Communicate -** In their science notebooks have students choose one event (rain, ice, pollution, etc) that they think is the most impactful on weathering and erosion. Why do they think it is the most impactful? Have they seen it happen in their everyday lives? **Lesson 10: Vocabulary: Weathering, Erosion, Deposition** **Gather** - Students will work through the Google Slides throughout this lesson. First, as a class discuss the different definitions for weathering, erosion, and deposition. Have students drag and drop the definitions for weathering, erosion and deposition based on prior knowledge. **Reason -** You can split students into groups to work on the "Web Search" part of the slides. Students will read the article linked on the topic and then answer the questions in each of the boxes below. Students will also research real life examples of weathering, erosion, and deposition. **Communicate** - Revisit the anchor phenomenon. Have students write in a reflection in their science notebooks answering the question: Do you think weathering, erosion or deposition impacted the shape of Peru's river over time? **Lesson 11: Fossils** **Gather -** Read aloud the book "Fossils Tell of Long Ago" or watch the video read aloud on Youtube. **Reason -** Students can work in partners. Using information from the video read aloud students can answer the following questions in their science notebooks. Questions: 1. What is a fossil? 2. How does the age of a fossil in a superficial layer of rock compare to the age of a fossil in a deep layer of rock? 3. What might you find in rock that would suggest an area was once covered by water? 4. How are plants helpful in studying the past climate of an area?	**Lesson 10:** ● Vocabulary Google Slides **Lesson 11:** ● "Fossils Tell of Long Ago" Video Read Aloud ● Phenomena Video

Communicate - Show students the phenomena video again. Have a class discussion on how fossils could help scientist identify the changing shape of the land.	
Episode 4 **Elaborate/Build New Content/Apply new Content** **Days: 2 days**	
Activity	**Resources**
1. Connection: "We have been investigating how natural earth processes can cause landscape changes. Today you are going to apply what you have learned to solve a problem that is being caused by the different types of landscape changes." 2. Show students photos of the castle and map of the land the castle is on (Slides 1-8). Explain to the class that their job is to work as a team of civil engineers and to design a way to prevent this historic building from collapsing into the river. Show video *Time-Lapse: The Power of Water* Direct student attention to the impact that the fast-moving water has on the landscape. Discuss as a class what happened during the video. 3. In a group students give students the final task Protect the Castle. Using what they have learned this unit students will create a claim on why the Castle is in danger and come up with a design to protect the castle. 4. Groups can share out their claims/designs and decide which design is best to protect the castle. 5. Think back to phenomena and reflect: a. Is it possible to protect that castle?	• Castle Slides • *Time-Lapse: The Power of Water* • Protect the Castle Worksheet
Episode 5 **Evaluate** **Days: 1 day**	
Assessment	**Resources**
Journal Writing/Decision Making Using all of what they have learned throughout the unit	• Pictures of where to live

students will have to make the decision on where they would want to live. They will have the option of Positano, Italy, Island Park, Idaho, and Albany New York. Students should write a response in their science notebook using the following guided questions:

1. Based on the pictures where would you choose to live?
2. Why do you think this is the safest location to live?
3. What might happen in the other locations based on your knowledge of weathering and erosion Use specific evidence to support your thinking.

Common Core Curriculum Connections:

ELA/Literacy –

- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS1-1)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS1-1)
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS1-1)
- RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2)

Mathematics –

- 4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. (4-ESS2-1)
- 4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4-ESS2-1),(4-ESS2-2)

Instructional Strategies: Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects (realia)	Charts	In pairs or partners
Manipulatives	Graphic organizers	In triads or small groups
Pictures & photographs	Tables	In a whole group
Illustrations, diagrams, & drawings	Graphs	Using cooperative group
Magazines & newspapers	Timelines	structures
Physical activities	Number lines	With the Internet (websites) or software programs
Videos & films		In the home language
Broadcasts		With mentors
Models & figures		

Differentiation Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/ expectations
Repeat/confirm directions	Increase task structure (e.g., directions, checks for understanding, feedback)	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding (e.g., writing, reading aloud, answering questions in class)	Individualized assessment tools based on student need
Audio Books	Utilize prereading strategies and activities: previews, anticipatory guides, and semantic mapping	Modified assessment grading

Unit 4: Earth and Human Activity	**Grade 4**	**Days - 15**

Standards:
Students who demonstrate understanding can:
4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; nonrenewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]

4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]

Anchoring Question:

- What types of designs can humans engineer to reduce the negative impact of environmental hazards?

Essential Questions:

1. How do natural resources (renewable and nonrenewable) impact our environment?
2. What types of natural processes cause hazardous effects?
3. How can we reduce the negative effects of natural hazards?

Enduring Understandings:

- When humans use natural resources for energy and fuel, it has an impact on the environment.
- Some natural resources can be used over and over, while others cannot.
- Earthquakes, tsunamis, volcanoes, and other natural processes can change the landscape of an environment and negatively impact humans.
- Humans can engineer designs that can help to minimize the negative effects of natural hazards.

Storyline Narrative / Big Ideas:
This unit begins with students viewing before and after photos of significant landscape changes due to earthquakes and volcanoes. Students will then conduct investigations to find out why these changes occurred, as well as exploring how natural resources can contribute to environmental and landscape change as well. Students will then go on to research natural disasters, natural resources, and how they affect humans. In the elaborate episode, students will use a computer simulation to design interventions that will prevent negative consequences of natural disasters. Finally, students will evaluate

Vocabulary Words: volcanoes, earthquakes, tsunamis, landslides, natural resources, renewable resources, nonrenewable resources, hazards

Science and Engineering Practices	Disciplinary Core Ideas	Cross Cutting Concepts
<u>Constructing Explanations and Designing Solutions</u> Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems: Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. (4-ESS3-2)	**ESS3.A: Natural Resources:** Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1) **ESS3.B: Natural Hazards:** A variety of hazards result from natural processes (e.g., earthquakes, tsunamis,	**Cause and Effect** - Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1) Cause and effect relationships are routinely identified, tested, aand used to explain change. (4-ESS3-2)

<u>Obtaining, Evaluating, and Communicating Information</u> Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods. Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)	volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) **ETS1.B: Designing Solutions to Engineering Problems:** Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	

Consolidated Supply List:

- Toothpicks
- miniature marshmallows
- Jello or another material that can act as a “jiggly” surface
- foil baking pans

Episode 1
Engage/Elicit Ideas
Days: 1 day

Lessons	Resources
Lesson 1: Phenomena- Earthquake and Volcano Before and After Photos **<u>Gather</u> -** Teacher will tell students they are displaying a slideshow of before and after photos (slides 5 - 11) of natural earth processes. (These are from volcanoes and earthquakes, but do not tell them that yet). Students will use this template(Notice Wonder Catcher) to make some “notice” and “wonder” statements. In small groups or partnerships, **<u>Reason</u> -** Students choose one photo from the slide show and draw a model. The photo should show a before and after and use labels to explain the causes and effect. . Remind them to consider these questions in their models: ● What evidence is there in the photo that the landscape has changed? ● How fast or slow was the change? ● What evidence supports your answer? ● How does this landscape change impact humans?	**Lesson 1:** ● Photos Link ● Notice Wonder Catcher

Communicate - Gather students back together for a whole class discussion. Create a claim about how the natural processes in these pictures impact humans.	
Episode 2 **Explore** **Days: 3 days**	
Lessons	**Resources**
Lesson 2: Natural Hazards Viewer **Gather -** Display the Natural Hazards Viewer website and tell students that they will be using this resource to learn more about where natural hazards happen most often. Demonstrate for students how to use the website, particularly the toggle buttons and zoom feature to change their view of data displayed on the map. **Reason -** Students will be using the website to collect data about the hazardous weather around the world. Have them answer these questions in their notebook. -Where do the most earthquakes happen? -Where do the most volcanoes occur? -Where do most tsunamis occur? -How are the location patterns of locations for earthquakes, volcanoes, and tsunamis similar? How are the patterns different? **Communicate:** Come back together as a whole class and discuss their observations and answers the following question: How might scientists use the data on these maps to reduce the damage and impact from these causes of rapid landscape change? **Lesson 3: Where Does Energy Come From?** Lesson - Where does energy come from? **Gather -** Play the introductory videos that go along with the lesson. **Reason -** Go through each step of the lesson with the videos while having students fill out their findings on the Mystery Science worksheets - Energy worksheet,, Water Sun, Wind Energy, Energy Plan **Communicate -** Continue to play the slides, and have each student select the final energy source they would use for "Boulderville."	**Lesson 2:** -NOAA Natural Hazards Link **Lesson 3:** • Lesson - Where does energy come from? • Energy worksheets • Water Sun, Wind Energy • Energy Plan

Lesson 4: Construct a Building to Withstand an Earthquake **Gather -** Show students the two videos of earthquakes from the following links: Video 1 (go to 5:45) Video 2 Ask students to write down what they notice and wonder for both videos (Notice Wonder Catcher). Explain the challenge they will be participating in today. Use this link to help. **Reason -** Conduct the investigation. Students can test out one design and then re-engineer a second design. Have students answer the following questions: ● What do you notice about the design of the structures? ● What similarities do you see in building designs? ● What features do you think help make the buildings earthquake-proof? **Communicate -** Students should share their answers to the above questions at the end of the lesson as a whole class or in small groups.	**Lesson 4:** ● Notice Wonder Catcher ● Link to more detailed lesson plan ● 30 toothpicks (per team) ● 30 miniature marshmallows (per team) ● One disposable foil pan (per team) ● Jello ● pre-set Jello or some sort of "jiggly" material to put in the pan as the base (per team)
Episode 3 **Explain** **Days: 6 days**	
Lessons	**Resources**
Lesson 5:- Vocabulary Splash **Gather** - display all the unit's vocabulary words on the board. Read each word to the class with a brief explanation of the words. **Reason -** partners sort these words in an open sort using their prior knowledge. Label each group of words. **Communicate** - share how they sorted these words to the class. **Lesson 6: Current Events - Natural Disasters Jigsaw (2 days)** *Note To Teachers*: This lesson should be done over 3 days: two days to research and one day to present.* **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals.	**Lesson 5:** Vocabulary - volcanoes, earthquakes, tsunamis, landslides, natural resources, renewable resources, nonrenewable resources, hazards **Lesson 6:** ● Chart ● Newsela ● Poster Paper

Gather - Explain that students will be working in groups or partnerships to research one of the following natural disaster events that occured in our world - Examples: Tsunami in Japan Volcano in Pompei Earthquake in Mexico Earthquake in San Francisco, Landslide in California Hurricane in Texas You can add any others to the list. **Reason -** Students will select their choice and get it approved by their teacher. Students will then use Newsela to research their topic and to fill out the chart about their topic. Students will present their findings to the class. They can create a poster or create a short Google Slide presentation to present. **Communicate -** Students present to the class. **Lesson 7: BrainPop Video- Natural Resources** **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Ask students what a natural resource is? **Reason -** Students will watch the video Natural Resources - BrainPOP and use the graphic organizer to take notes. (The graphic organizer is located in the Brainpop lesson.) **Communicate -** Assign the sortify game to students. Partners work together to sort the natural resources using what they learned from the video. Partners share how they sorted the natural resources. **Lesson 8: Natural Disaster Prevention** **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Begin the lesson with the question: "What do you think scientists and engineers can do to prevent damage from natural disasters?" Ask students to share with a partner or share as a whole group.	**Lesson 7:** ● Natural Resources - BrainPOP ● Graphic organizer in lesson ● Sortify Game in lesson **Lesson 8:** Newsela Articles: ● Newsela Article: Tsunami Escape Pod ● Newsela Article: Volcano Predictions ● Newsela Article: Steel Building Passes Earthquake Test ● Newsela: Predicting Earthquakes ● Discovery News- Earthquake Proof Buildings

Reason - Explain to students that they will be reading a Newsela article about how scientists and engineers are working to improve predictions and lessen the negative effects of natural disasters. Assign partners to one of these articles to the right. Students should note-take while they are reading their assigned article to answer the following question: ● What are scientists/engineers/architects doing to prevent damage from natural disasters? *Teacher Note*- if you feel like the amount of articles/videos might overwhelm your students, you can narrow it down for them. You may also choose to do this lesson over 2 days. **Communicate -** Come together as a whole group and share their article. Create a class chart to answer the main question - What are scientists/engineers/architects doing to prevent damage from natural disasters? Make sure this chart is visible for the evaluate episode later in the unit. **Lesson 9: Weather Hazard Simulation** **Stop Disasters Computer Simulation Game** **Vocab. Focus** - choose a few vocabulary words to focus on. Students write the word, draw a picture of the word and write the word in a sentence in their journals. **Gather -** Tell students tht they will simulate a weather hazard. Give students a tutorial of the website - Stop Disasters Game **Reason** - In groups of 2-3, students will play a computer simulation game. First, they choose a natural disaster and a location. Then, they read the criteria they must fulfill to protect that location. They then have a budget and build and create different structures and items to prevent negative effects of their natural disaster. Students will fill out the "Stop Disasters" worksheet as they plan and try out their simulation. They will construct an argument for their best solution. If time allows, students can present their findings to the class. *Note To Teachers: Be sure to show students the features of the game and how to meet the criteria for each natural disaster. It might be best to allow them to "play" with the game for a few minutes before constructing their designs.* **Communicate** - Share your experiences on FlipGrid.	● Tsunami Proof House **Lesson 9:** ● Stop Disasters Game Link ● Stop Disasters Worksheet

Episode 4 **Elaborate/Build New Content/Apply new Content** **Days: 3 days**	
Activity	**Resources**
STEAM Challenge Mini-Landslide - Activity - TeachEngineering	• cardstock, 1 sheet, for construction of model houses • 2 small paper cups; one for water, one for test material • Mini-Landslide Worksheet, one per student • 2 ft (.6 m) section of plastic downspout (available at hardware stores; ~$5) • 1 small bag of sand • 1 small bag of gravel • 1 small bag of volcanic (lava) potting rock (available at garden and landscaping stores) • plastic bins to hold, wet and store the sand, gravel and volcanic potting rock (optional, but helpful) • 1 large, shallow, plastic waterproof tub (8-in x 14-in x 30-in or 20-cm x 36-cm x 76-cm, clear plastic is better but not necessary) • plastic scoop (optional, or use small paper cup) • duct tape • Model House Template • Mini-Landslide sheet
Episode 5 **Evaluate** **Days: 1 day**	
Assessment	**Resources**
Science Journal Writing Assessment Students should select one natural hazard from the three this unit focused on: earthquakes, tsunamis, volcanic eruptions. In their science notebooks (or on a Google Slide, Google Doc, Google Drawing), students should: Students write an informational text: Checklist - Information Checklist- Grades 4-5.pdf 1. Identify what causes their natural disaster	Information Checklist- Grades 4-5.pdf

2. Identify the effects of their natural disaster on the land and the community that lives there
3. Draw a picture of the natural disaster occurring and label the causes and effects
4. Explain what kind of device or structure can be used/created that can protect people, warn people, or predict the timing or location of the natural hazard

Allow students to use notes from their science notebooks to complete the assessment. When completed, students can exchange assessments and give compliments and suggestions to each other.

Common Core Curriculum Connections

ELA/Literacy –

- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2)
  W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-ESS3-1)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS3-1)
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-ESS3-1)

Mathematics –

- 4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1),(4-ESS3-2)

Instructional Strategies: Supports for English Language Learners

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects (realia)	Charts	In pairs or partners
Manipulatives	Graphic organizers	In triads or small groups
Pictures & photographs	Tables	In a whole group
Illustrations, diagrams, & drawings	Graphs	Using cooperative group
Magazines & newspapers	Timelines	structures
Physical activities	Number lines	With the Internet (websites) or software programs
Videos & films		In the home language
Broadcasts		With mentors
Models & figures		

Differentiation Strategies

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/ expectations
Repeat/confirm directions	Increase task structure (e.g., directions, checks for understanding, feedback)	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding (e.g., writing, reading aloud, answering questions in class)	Individualized assessment tools based on student need
Audio Books	Utilize prereading strategies and activities: previews, anticipatory guides, and semantic mapping	Modified assessment grading