Curriculum Writing Notes:

Address UDL and CELP AFTER learning targets are written, in process they'll be developed after all learning targets and success criteria. These targets with UDL and CELP will be a model of what could/should be done for all learning targets but can't be completed (to keep the process concise) . Through the curriculum writing process, teachers can build a deeper understanding of how to approach this differentiation.

Enduring understanding/Essential questions may be easier to develop at the end of the process.

Committees can alter the format but these are the required pieces.

Course Title:	**Content Area:**	**Grade Level:**	**Credit (if applicable)**
Grade 4 Science	**Science**	**Grade 4**	N/A
Course Description:			

Aligned Core Resources:	**Connection to the *BPS Vision of the Graduate***
N/A	Collaboration • Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal • Assume shared responsibility for collaborative work and value the individual contributions made by each team member Communication • Articulates thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts Critical Thinking and Problem Solving • Collect, assess and analyze relevant information • Reason effectively. • Make sound judgements and decisions. Identify, define and solve authentic problems and essential questions. • Reflect critically on learning experience, processes and solutions. • Transfer knowledge to other situations
Additional Course Information: ***Knowledge/Skill Dependent courses/prerequisites***	**Link to *Completed Equity Audit***
N/A	Grade 4 Science Equity Audit
Standard Matrix	

District Learning Expectations and Standards	Unit 1	Unit 2	Unit 3
4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.	X		
4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.	X		
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	X		
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.	X		
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	X		
4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.		X	
4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.		X	
4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.*		X	
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.		X	
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.		X	
4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.			X
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.			X
4 ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.			X
4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.			X
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.			X

Unit Links

If unit headings are formatted as a heading, then we can link a Table of Contents to better organize and provide

faster access to each unit

Unit 1: National Parks
Unit 2: Bear Sense
Unit 3: Forces That Move Earth

Unit Title:

Unit 1: National Parks

Relevant Standards: Bold indicates priority

4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.

SEP	Constructing Explanations and Designing Solutions ● Use evidence (e.g., measurements, observations, patterns) to construct an explanation.
DCI	PS3.A: Definitions of Energy ● The faster a given object is moving, the more energy it possesses.
CCC	Energy and Matter ● Energy can be transferred in various ways and between objects.

4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.

SEP	Asking Questions and Defining Problems ● Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
DCI	PS3.A: Definitions of Energy ● Energy can be moved from place to place by moving objects or through sound, light, or electric currents. PS3.B: 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. PS3.C: Relationship Between Energy and Forces

	<table><tr><td></td><td>• When objects collide, the contact forces transfer energy so as to change the objects' motions</td></tr><tr><td>CCC</td><td>Energy and Matter • Energy can be transferred in various ways and between objects.</td></tr></table>
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	<table><tr><td>SEP</td><td>Constructing Explanations and Designing Solutions • Identify the evidence that supports particular points in an explanation</td></tr><tr><td>DCI</td><td>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.</td></tr><tr><td>CCC</td><td>Patterns • Patterns can be used as evidence to support an explanation.</td></tr></table>
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.	<table><tr><td>SEP</td><td>Planning and Carrying Out Investigations • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.</td></tr><tr><td>DCI</td><td>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. ESS2.E: Biogeology • Living things affect the physical characteristics of their regions.</td></tr><tr><td>CCC</td><td>Cause and Effect • Cause and effect relationships are routinely identified, tested, and used to explain change.</td></tr></table>
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely	

<table>
<tr>
<td>to meet the criteria and constraints of the problem.</td>
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<table>
<tr><td>SEP</td><td>Constructing Explanations and Designing Solutions
● Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.</td></tr>
<tr><td>DCI</td><td>ETS1.B: Developing Possible Solutions
● Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.
● At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.</td></tr>
<tr><td>CCC</td><td>Influence of Science, Engineering, and Technology on Society and the Natural World
● Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.</td></tr>
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<tr><th>Essential Question(s):</th><th>Enduring Understanding(s):</th></tr>
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Why do landforms change?
How did the landforms that make up Grand Staircase - Escalante National Park come to take their current shape?
What forces cause weathering and erosion?
What is energy and how does it relate to the changing landscape?
What can humans do to prevent or decrease the damage caused by erosion in an area?
How can patterns of rock formations and fossils help us learn about the history of Earth?

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Make observations about the landscape in various regions of the United States
Generate possible explanations for process/forces that may have shaped land over time at the Arches
Ask questions about how/why the landscape varies across the United States

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<tr><th>Demonstration of Learning:</th><th>Pacing for Unit</th></tr>
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Use evidence (e.g., measurements, observations, patterns) to construct an explanation. 4-PS3-1
Identify the evidence that supports particular points in an explanation. 4-ESS1-1P
Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. 3-5-ETS1-2
Asking Questions and Defining Problems
Ask questions that can be investigated and predict reasonable outcomes based on patterns

</td>
<td>6 weeks</td>
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such as cause and effect relationships. 4-PS3-3
- Planning and Carrying Out Investigations
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. 4-ESS2-1

Family Overview (link below)

Family Overview Unit 1 Grade 4

Integration of Technology:

Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning

Unit-specific Vocabulary:

Sediment	Weathering	Erosion
Water	Ice	Gravity
Surface	Region	Landform
Formation	Movement	Weathered Rock
Rock Breakage	Motion	Speed
Chemical	Mechanical	Transfer
Contact	Energy	Unit
Weight	Kinetic	Force
Momentum	Mass	Conservation of energy
Layer	Form	Ocean
Earth's Surface	Rock Composition	Fossil
Fossil	Prehistoric Organism	Rock Layer
Mountain	Ocean Floor	Organism
Index	Fossil	Time Periods

Aligned Unit Materials, Resources, and Technology (beyond core resources):

- class summary table
- The Grand Staircase - Escalante National Park
- PBS Learning Media: Erosion & Weathering
- Weathering and Erosion Study Jams
- CT River Oxbow Lake Aerial Photo
- Generation Genius Collision Video
- Mudslide Caught on Camera
- Why Do Rivers Curve?
- Erosion and Soil Video
- layers
- Fossil
- land formations
- reading together on smartboard
- dating layers
- fossil rock anthem
- Grand Canyon forms

Opportunities for Interdisciplinary Connections:

Literacy connections:
- Students are asking and answering questions
- Referring to a text

Anticipated misconceptions:

Students may believe that:

● Rocks can't be broken down

• Recalling information and data from multiple sources Math Connections: • Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. • 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. • Operations and Algebraic Thinking	• Rocks do not change • Weathering and erosion are the same thing. The two words can be used interchangeably • Erosion happens quickly • Erosion is always bad • Plants don't affect rocks and soil • Humans cause all erosion • Humans cannot impact erosion • Mountains are all the same age
Connections to Prior Units:	**Connections to Future Units:**
K-PS2.B: When objects touch or collide, they push on one another and can change motion. 2-ESS2.A: Wind and Water can change the shape of land. 2-ESS1.C: Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. 3-PS2.A: Each force acts on one particular object and has both strength and direction. An object at rest typically has multiple forces acting on it, but they add up to zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. K-2-ETS1.A: A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. Asking questions, making observations and gathering information is helpful in thinking about problems. Before beginning to design a solution, it is important to clearly understand the problem. (B) Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (C Because there is always more than one possible solution to a problem, it is useful to compare and test designs.	Grade 7 Unit 2: Fossils on Mount Everest connection to fossil content • MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
Differentiation through *Universal Design for Learning*	
UDL Indicator	**Teacher Actions:**
3.3 Guide information processing and visualization	• Give explicit prompts for each step in a sequential process • Provide interactive models that guide

	exploration and new understandings • Provide multiple entry points to a lesson and optional pathways through content
Supporting Multilingual/English Learners	
Related *CELP standards:*	**Learning Targets:**
An EL can conduct research and evaluate and communicate findings to answer questions or solve problems An EL can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.	I can conduct short research projects to answer a question I can participate in extended conversations, discussions, and extended written exchanges using academic and domain specific vocabulary build on the ideas

Learning Sequence	Learning Target & Success Criteria	Assessments/ Resources
1	• I can make observations about the landscape in various regions of the United State ○ I can generate possible explanations for process/forces that may have shaped land over time at the Arches ○ I can ask questions about how/why the landscape varies across the United States	class summary table
2	• I can make observations of various landscape/rock formations from Escalante Grand Staircase ○ I can investigate forces that act on shape the land ○ I can define and provide examples of weathering and erosion ○ I can summarize the similarities and differences between weathering and erosion ○ I can construct an explanation of the cause and effect of landform changes over time	Weathering and Erosion at Grinnell Glacier Basin in Glacier National Park
3	• I can conduct an investigation to observe the transfer of energy between objects ○ I can use data to explain how the mass of an object and the speed of an object can impact a resulting collision ○ I can identify energy transfer with evidence in landscape change ○ I can compare high energy vs slow energy weathering and erosion events ○ I can explain how water can shape the land	Students use Images around the United States to explain how water has changed the land. Students will identify evidence of erosion and the energy source of that erosion event. Students will use their evidence to determine if the event occurred over a short term or long term.
4	• I can Identify an erosion problem on school grounds ○ I can identify an erosion problem on school grounds ○ I can make observations of how living things affect the	• Respond as individuals to slide 8

	physical characteristics of their regions ○ I can generate a variety of solutions to prevent or decrease the rate of erosion considering constraints ○ I can build and test erosion solutions in simulation ○ I can use qualitative and quantitative data to improve design solutions ○ I can reflect on simulated engineering design process	• Share out responses as a class • Add important ideas to class summary table
5	• I can demonstrate how patterns of rock layers can form and explain relative age ○ I can explain that fossil presence and location indicate rock layer age and formation ○ I can identify and describe how major Earth forces (earthquakes, volcanoes, mountain building) cause changes in rock layers and the landscape	The culminating task for this unit brings students back to the map of the US regions and asks the students to generate a model of current landscape, forces that led to its development and predict future landscape in that geographic location. Students use a State or National park to research (encourage at least one CT state park for relevancy in the class). Students use appropriate academic vocabulary and provide scientific evidence and reasoning for landscape explanations and predictions. Culminating Task Resource

Unit Title:

Unit 2: Bear Sense

Relevant Standards: Bold indicates priority

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

SEP	Planning and Carrying Out Investigations ● Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
DCI	PS3.A: Definitions of Energy ● Energy can be moved from place to place by

	moving objects or through sound, light, or electric currents. PS3.B: 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. • Light also transfers energy from place to place. • 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.
	CCC: Energy and Matter • Energy can be transferred in various ways and between objects.
4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	SEP: Developing and Using Models • Develop a model to describe phenomena
	DCI: PS4.B: Electromagnetic Radiation • An object can be seen when light reflected from its surface enters the eyes.
	CCC: Cause and Effect • Cause and effect relationships are routinely identified.
4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.*	SEP: Constructing Explanations and Designing Solutions • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.
	DCI: 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. 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
CCC	Patterns • Similarities and differences in patterns can be used to sort and classify designed products.
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	
SEP	Engaging in Argument from Evidence • Construct an argument with evidence, data, and/or a model.
DCI	LS1.A: Structure and Function • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
CCC	Systems and System Models • A system can be described in terms of its components and their interactions.
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.	
SEP	A system can be described in terms of its components and their interactions. • Use a model to test interactions concerning the functioning of a natural system.
DCI	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.
CCC	Systems and System Models • A system can be described in terms of its components and their interactions.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	

SEP	Constructing Explanations and Designing Solutions ● Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem
DCI	ETS1.B: Developing Possible Solutions ● Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. ● At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.
CCC	Influence of Science, Engineering, and Technology on Society and the Natural World ● Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands

Essential Question(s):	**Enduring Understanding(s):**
• How will understanding bear senses allow for effective bear deterrent designs? • How do organisms detect, process and use information about the environment? • How does sound travel through different materials? How is energy transferred between objects or systems? • How does light affect sight? • How does heat affect odor intensity, and how does color affect temperature? • How can we use electricity to detect a bear's presence? • How can we use light or sound patterns to send a message? • How can various design solutions be compared and improved? •	• Apply their understanding of energy to design, test, and refine a device that converts energy from one form to another. • Develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. • Use a model of waves to describe patterns of waves in terms of amplitude and wavelength, and that waves can cause objects to move. • Develop a model and describe that an object can be seen when light reflected from its surface enters the eye. • Develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collision
Demonstration of Learning:	**Pacing for Unit**
CFA Pavlov's Dogs Design, Draft, Revise, Evaluate Bear Deterrent Box	6 weeks
Family Overview (link below)	**Integration of Technology:**

Family Overview Letter Bundle 2	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning* • Energy Form changes Demonstration -Phet Interactive Model • Color vision Light Simulator -Phet Interactive Model
Unit-specific Vocabulary:	**Aligned Unit Materials, Resources, and Technology (beyond core resources):**

energy	evidence	transfer
predict	pattern	cause
effect	sound	light
Electric current	heat	collide
motion	explanation	regional
local	global	Rock formation
Earthquake	Fossil	layer
observation	measurement	data
phenomenon	rainfall	water
ice	wind	organism
gravity	soil	sediment
particles	Physical characteristics	change
compare	problem	solution
criteria	constraint	research
test	communicate	proposed
Design process	improve	engineers
technology	benefit	risk
Societal demand		

- Bear Video
- Summary Table
- The 5 Senses Video
- Wild Wicked Wonderful Top 10 Super Senses Epic Book
- Loomed version Super Animal Senses
- Can Plants Think?
- safe link for bear video
- Loomed Engage Learning Sequence 3
- Loomed Explore experiment set up
- **EPIC**-What Are Sound Waves? by R. Johnson (Loom Version)
- Bill Nye- Sound Travels in Waves
- SciShow What is Sound?*
- Sound On The Move
- **Read Text:** *What if you had Animal Ears? (electronic IRA)*
- Grizzly Bear Listening to Music
- How Do Animals See in the Dark?
- Animal Eyes or (Loom version)
- How Your Eyes Work
- Teacher Resource: PBS what smell looks like
- The Nose Knows: Smell, Memory, and Emotion
- How do we smell?
- Extraordinary Animal Behavior On Trail Camera Video
- Game On
- The Power of Circuits safelink
- Sequence 6 ElaborateLoomed lesson)
- How Do Cellphones Work?

Opportunities for Interdisciplinary Connections:	**Anticipated misconceptions:**
ELA/Literacy - • Supporting a point of view with reasons and information	Students may believe that: • Once a bear has tasted human food, they will not eat wild food

• Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. • Conduct short research projects that build knowledge through investigation of different aspects of a topic. <u>Mathematics -</u> • 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. • Operations and Algebraic Thinking • Reason abstractly and quantitatively. • Model with mathematics. • Use appropriate tools strategically.	• If you keep your garbage and compost in a garage, bears will not be attracted to your yard • Bears have bad eyesight • Reflected light is just shine or glare not something associated with seeing objects • Light is not reflected in a predictable manner and angle • Light travels from our eyes so we can see. • Bears' super sense of smell makes up for poor eyesight • Sound can only travel through air • Sound moves faster in air than in solids (air is "thinner" and forms less of a barrier)
Connections to Prior Units:	**Connections to Future Units:**
K-2-ETS1.A: A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. Asking questions, making observations and gathering information are helpful in thinking about problems. Before beginning to design a solution, it is important to clearly understand the problem. (B) Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (C Because there is always more than one possible solution to a problem, it is useful to compare and test designs. 1-PS4.A: Sound can make matter vibrate, and vibrating matter can make a sound. 1-PS4.B: Objects can be seen if light is available to illuminate them or they give off their own light. 1-PS4.C: People use a variety of devices to communicate and send and receive information over long distances. 1-LS1.A: All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp, objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, and fruit) that help them survive and grow. 1-LS1.D: Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. 3-5 ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost. 3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are	

considered to identify aspects of a model or prototype that can be improved. 3-PS2.A: The patterns of an object's motion in various situations can be observed and measured: when that past motion exhibits a regular pattern, future motion can be predicted from it. 3-LS3.B: Different organisms vary in how they look and function because they have different inherited information.	

Differentiation through *Universal Design for Learning*	
UDL Indicator	**Teacher Actions:**
3.3 Guide information processing and visualization	• Give explicit prompts for each step in a sequential process • Provide interactive models that guide exploration and new understandings • Provide multiple entry points to a lesson and optional pathways through content

Supporting Multilingual/English Learners	
Related *CELP standards:*	**Learning Targets:**
An EL can conduct research and evaluate and communicate findings to answer questions or solve problems An EL can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.	I can conduct short research projects to answer a question I can participate in extended conversations, discussions, and extended written exchanges using academic and domain specific vocabulary build on the ideas

Learning Sequence	**Learning Target & Success Criteria**	**Assessments/ Resources**

1	• I can make observations on bear behavior
	  ○ I can generate initial questions to begin investigation of bear behavior, bear senses, and bear interactions with humans
	  ○ I can identify the unit problem we will collaboratively solve: how can we limit negative bear/human interaction?
		• Record and share with Notice/Wonder chart
		• Create a Driving Question Board
		• Begin class summary table
		summary table

2	• I can identify and provide examples of animals' five senses ○ I can explore senses at stations and connect how perceptions and memories guide responses- • I can explain at least one way that a plant and animal responds for survival • I can begin a bear deterrent design applying the cause and effect relationship between sense perceptions	• Build concept map of 5 senses • Record sensory station data and complete written response: How do senses impact our actions?

	and remembered responses as a means of altering behaviors-P	• Explain one animal and plant • survival behavior/structure • Draft bear deterrent design
3	I can make observations and use data to explain how different materials conduct sound wave energy • Draw and label a sound wave model • Incorporate sound energy transfer into the bear deterrent design	• Use Claim Evidence Reasoning template to explain impact of material on sound energy • Build class anchor chart on sound, including a visual of amplitude and wavelength • Add to class summary table and revise bear deterrent designs
4	• I can make observations of how different amounts of light can impact what I see ○ I can use an explanatory model to explain that light is necessary to see any object. ○ I can explain how a specialized animal structure can impact vision. ○ I can modify the bear deterrent design using the principles of light on sight.	• Share observations from engage/explore investigation • Build class concept map on sight • Develop and use an explanatory model of light-sight • Add to class summary table and revise bear deterrent designs
5	• I can explain the impact of temperature on odor intensity ○ I can generate and graph data from an investigation ○ I can analyze data and use it to support my claim ○ I can incorporate the interactions of color, temperature, and odor intensity into the bear deterrent design	• Use CER template to explain cause/effect relationship of temperature-smell investigation • Create class graph on Color/Temperature • Analyze data and use it support a claim-short form CER template • Add to class summary table and revise bear deterrent designs CFA: Student Assessment Task
6	• I can demonstrate kinetic energy ○ I can investigate how an electric current can be used to transfer energy to light energy	• Design a kinetic energy transfer with material set • Develop a complete

	○ I can transmit a simple message with light or sound patterns ○ I can apply electrical energy to the bear deterrent design ○ I can present and compare various bear deterrent designs (culminating task)	circuit with wire, battery, light bulb ● Generate methods to transmit Danger/Help message with lights or sound patterns ● Add to class summary table and revise bear deterrent designs ● Identify strengths and weaknesses in the final presentation of class bear deterrent designs

Unit Title:

Unit 3: Forces That Move Earth

Relevant Standards: Bold indicates priority

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

SEP	Constructing Explanations and Designing Solutions ● Apply scientific ideas to solve design problems.
DCI	PS3.B: Conservation of Energy and Energy Transfer ● Energy can also be transferred from place to place by electric currents, which can then be used to locally produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. 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. ETS1.A: Defining Engineering Problems (from 3-5 ETS 1-1) ● Possible solutions to a problem are limited by the 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.
	CCC	Energy and Matter ● Energy can be transferred in various ways and between objects.
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.		
	SEP	Developing and Using Models ● Develop a model using an analogy, example, or abstract representation to describe a scientific principle.
	DCI	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. ● Waves of the same type can differ in amplitude (height of the wave) and wavelength (spaced between wave peaks).
CCC	Patterns ● Similarities and differences in patterns can be used to sort, classify, and analyze simple rates of change for natural phenomena.

4 ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

SEP	**Analyzing and Interpreting Data** ● Analyze and interpret data to make sense of phenomena using logical reasoning.
DCI	**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.
CCC	Patterns ● Patterns can be used

<table>
<tr><td></td><td></td></tr>
<tr><td>4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.</td><td>
<table>
<tr><td>SEP</td><td>Constructing Explanations and Designing Solutions
● Apply scientific ideas to solve design problems.
● Use scientific information to design 2 or more solutions.</td></tr>
<tr><td>DCI</td><td>ESS3.B: Natural Hazards
● A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

ETS1.B: Developing Possible Solutions
● Testing a solution involves investigating how well it performs under a range of likely conditions.</td></tr>
<tr><td>CCC</td><td>Energy and Matter
● Energy can be transferred in various ways and between objects.

Cause and Effect
● Cause and effect relationships are routinely identified, tested, and used to explain change.

Patterns
● Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.</td></tr>
</table>
</td></tr>
<tr><td>4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.</td><td>
<table>
<tr><td>SEP</td><td>Obtaining, Evaluating,</td></tr>
</table>
</td></tr>
</table>

		and Communicating Information ● Obtain and combine information from books and other reliable media to explain phenomena.
	DCI	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.
	CCC	Cause and Effect ● Cause and effect relationships are routinely identified and used to explain change.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.		
	SEP	Constructing Explanations and Designing Solutions ● Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.
	DCI	ETS1.B: Developing Possible Solutions ● Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. ● At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared

	ideas can lead to improved designs.
CCC	Influence of Science, Engineering, and Technology on Society and the Natural World ● Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands.

Essential Question(s):	**Enduring Understanding(s):**
• What forces are responsible for the movement of the Earth's surface (and everything on it)? • What energy and forces are acting on the Earth's crust during an earthquake? • What are waves and how do they affect the Earth's crust and humans? • Where does energy come from? • How are renewable and nonrenewable resources impacting our environment? • How can we utilize renewable energy?	• They apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. • The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. • Students are expected to develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collisions. • They apply their understanding of energy to design, test, and refine a device that converts energy from one form to another.
Demonstration of Learning:	**Pacing for Unit**
	6 Weeks
Family Overview (link below)	**Integration of Technology:**
Family Overview Unit 3 Grade 4	*Intentionally aligned use of digital tools and resources to support acquisition of content, researching, organizing and communicating learning* • Tectonic Plates, Earthquakes, and Volcanoes Interactive Map • PBS Mountain Maker, Earth Shaker Interactive Map • PBS Kids Build - Seismic Shake-Up • energy conversion simulation

Unit-specific Vocabulary:

Design	Problem	Solution
Energy	Stored Energy	Practical Use
Transfer	Transform	Electric
Electric Current	Motion	Sound
Heat	Light	Resource
Material	Criteria	Constraints

Aligned Unit Materials, Resources, and Technology (beyond core resources):

- Summary Table-Forces that Move Earth
- Article
- Shake Table Demo Teacher Build
- Earthquakes
- Loomed Earthquakes
- USGS - The Science of Earthquakes
- Loomed USGS website reading
- The Science of an Earthquake
- Loomed version 12-17
- Layers of earth demo
- mountain formation
- Mountains
- sci show kids earthquakes
- Wave Simulation Video
- WAVES
- ***Loomed version Waves!***
- Tsunami
- tsunami TEDEd
- tsunami animation
- comparing Tsunamis To Other Waves
- nat geo kids
- Tsunami FAQ
- Wave and Current
- forces moving earth
- Bill Nye electricity
- energy overview
- renewable energy
- Loomed Climate Change and Energy
- recorded TEXT
- interview

Opportunities for Interdisciplinary Connections:

ELA/Literacy -

- 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.
- 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.
- Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably

Anticipated misconceptions:

Students may believe:
- The Earth has always looked the way it does now
- The Earth's crust does not change and/or move.
- That earthquakes only occur on the west coast of the United States (California)
- Continents do not move
- People can stop an earthquake
- Earthquakes happen randomly across the earth's surface
- The ground opens up during an earthquake
- That as waves move, matter moves along with them
- That sound waves move faster in air than in solids or liquids
- That waves do not have energy

Mathematics - • Reason abstractly and quantitatively. • Use appropriate tools strategically • Model with mathematics.	
Connections to Prior Units:	**Connections to Future Units:**
K-2 ETS1.A: A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. Asking questions, making observations and gathering information are helpful in thinking about problems. Before beginning to design a solution, it is important to understand the problem. (B) Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (C Because there is always more than one possible solution to a problem, it is useful to compare and test designs. K-ESS3.B: Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. 2-ESS1.C: Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.	
Differentiation through *Universal Design for Learning*	
UDL Indicator	**Teacher Actions:**
3.3 Guide information processing and visualization	• Give explicit prompts for each step in a sequential process • Provide interactive models that guide exploration and new understandings • Provide multiple entry points to a lesson and optional pathways through content
Supporting Multilingual/English Learners	
Related *CELP standards:*	**Learning Targets:**
An EL can conduct research and evaluate and communicate findings to answer questions or solve problems An EL can participate in grade appropriate oral and written exchanges of information, ideas, and analyses, responding to peer, audience, or reader comments and questions.	I can conduct short research projects to answer a question I can participate in extended conversations, discussions, and extended written exchanges using academic and domain specific vocabulary build on the ideas

Lesson Sequence	Learning Target & Success Criteria	Assessments/ Resources

1	• I can make observations on multiple examples of destruction.
	  ○ I can generate and group questions on the possible causes of multiple examples of destruction
	  ○ I can locate "destruction" sites on world map to consider patterns
	  ○ I can develop an initial model to explain how an event happened
		• Summary Table-Forces that Move Earth

2	• I can make observations and use information to understand Moodus noises
	  ○ I can design and test earthquake proof structures
	  ○ I can compare design effectiveness with supporting data in post building design analysis
	  ○ I can obtain and use information from multiple sources to understand and explain cause-effect relationships of earthquakes
	  ○ I can explain and show what happens with various plate boundary movements
	  ○ I can describe and explain earthquake patterns on a map
	  ○ I can use evidence from the Interactive Map to explain relationships of tectonic plates to earthquakes and volcanoes
		• Students regroup earthquake ideas from class concept map/anchor chart to their own maps, working in small groups or individuals

3	• I can explore sound with cup communicators
	  ○ I can explain how the cup communicators transfer sound
	  ○ I can investigate water waves and record observations
	  ○ I can describe water waves with relevant vocabulary
	  ○ I can compare surface water waves and tsunami waves with venn diagram and explanatory models
	  ○ I can obtain and organize information to explain the impact of tsunamis on land and people
	  ○ I can revise initial models from LS 1 to determine cause/effect of destruction
	  ○ I can explain patterns of earthquakes, volcanoes, and tsunami locations on World Tectonic Plate Boundary Map
		• Locate sites electronically

4	• I can generate ideas and ask questions about the demands of energy for human transportation
	  ○ I can observe and record types of energy use at school and at home
	  ○ I can categorize energy types and their sources
	  ○ I can determine energy source trends and their implications
	  ○ I can compare renewable and nonrenewable energy resources
	  ○ I can design and test windmills to demonstrate energy transfer
	  ○ I can analyze windmill data
	  ○ I can design and present a creative advertising
		LS 4 CFA

	campaign to promote the uses and benefits of wave energy or geothermal energy	