



Park Hill School District

Building Successful Futures • Each Student • Every Day

Fourth Grade Science Curriculum

Course Description: In fourth grade, students will experience three science domains; physical science, life science, and earth and space science. During the physical science unit, students learn that energy can be transferred from place to place by sound, light, heat, and electric currents. They will describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. For life science, students experience learning that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. And in earth and space science, students learn about rock formations, effects of weathering, and describe patterns of Earth's features.

Scope and Sequence:

Quarter	Unit	Timeframe
1	<u>Life Science, Unit 1</u> • Topic 1: Plant and Animal Parts • Topic 2: Sense Receptors	6 Days 7 Days
2	<u>Physical Science, Part 1, Unit 2</u> • Topic 1: Energy and Speed • Topic 2: Energy Transfer and Electric Currents	5 Days 7-8 Days
3, 4	<u>Physical Science, Part 2 Unit 3</u> • Topic 1: Motion of Waves • Topic 2: Wavelength and Amplitude	5 Days 5-6 Days
4	<u>Earth and Space Science, Unit 4</u> • Topic 1: Rock Patterns • Topic 2: Changing Land • Topic 3: Plate Tectonics	6 Days 11-12 Days 5 Days

Curriculum Revisions 2023-2024:

- Conversion to 3D version- Added Investigative Phenomena, Graphic Organizers, Picture Vocabulary Strategies, Mission Tasks (to replace PEATs for Engaging Scenarios)

Unit 1: Life Sciences

Subject: Science

Grade: 4th

Name of Unit: Life Sciences

Length of Unit: 13 days

Overview of Unit: Students experience the sciences that deal with living organisms and life processes through constructing an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction, using 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.

Materials for the Engaging Scenario: Students will design a zoo that is organized by grouping animals with the best sense receptors, and students will describe how having those sense receptors helps animals survive. In addition, students will design a scavenger hunt for students who go on field trips to the zoo.

Printed

1 Mission Log (per student or group)

1 Action Plan (per student or group)

Consumable

1 Paper (per student or group)

Reusable

1 Pencil (per student or group)

1 Computer with internet access (per group)

Topic 1: Plant and Animal Parts

Suggested Length of Time: 6 Days

Essential Questions (Student Wondering):

What do an animal's unique parts have to do with its survival?

Enduring Understanding (Learning Objectives):

- The student is expected to construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Standards Addressed

Missouri Learning Standards

- 4.LS1.A.1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and plant reproduction.
- 5.LS1.A.1 Compare and contrast the major organs/organ systems (e.g. support, reproductive, digestive, transport/circulatory, excretory, response) that perform similar functions for animals belonging to different vertebrate classes.

Priority (Disciplinary Core Ideas):

- 4-LS1.A.1 Structure and Function: Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.
- 5-LS1.A.1 Compare and contrast the major organs/organ systems that perform

similar functions for animals belonging to different vertebrate classes.

Supporting (CC & SEP):

- Systems and System Models → System Description: A system can be described in terms of its components and their interactions.
- Engaging in Argument from Evidence → Construct and/or support an argument with evidence, data, and/or a model.

Detailed Description/Instructions:

Standard/ CC	5E Model:	Suggested # of Days	Notes
	Engage; Investigative Phenomena		• Watch Setup Video. • Prepare for the unit by purchasing plants, celery stalk and fruit. • Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
4-LS1.A.1	Engage: Accessing Prior Knowledge	½ day	• During this lesson students should use background knowledge to predict how adaptations help plants and animals meet their basic needs.
4-LS1.A.1	Engage: Hook	½ day	• By the end of this lesson students should describe characteristics of an organism and how it gets food. • Be sure to have the organism names written in class prior to lesson.
4-LS1.A.1 (CC Systems Description)	Explore 1: Activity- Plant Guts Students observe the different parts and structures of a plant.	1 day to Explore 1 day for C.E.R.	• Materials to collect prior to lesson, plant in dirt, celery with leaves, fruit with internal seeds • CC: Describe or diagram how components of plants work together.
	Explore 3: Activity- Adaptation Matchup Students will match physical traits	1 Day	Preparation Print out one Student Handout and one Student Journal per student.

	with how they support an organism's ability to survive, grow, and reproduce.		
4-LS1.A.1 5-LS1.A.1	Explain: STEMscopedia Picture Vocabulary Strategy Students will play a game of I Have ... Who Has?	1 Day	● Use graphic organizer under Engage dropdown menu to support learning. ● By the end of this lesson students should be able to connect and engage and explore content standards.
4-LS1.A.1	Elaborate: Teacher Choice 	If time allows	● By the end of this lesson students should be able to connect, engage and explore the real world. ● Additional Elaborate activities are optional per teacher choice and student needs. ● Elaborate activities could be taught through a science workshop model with centers. ● Consider opportunities to digitally connect with experts and community members on topics related to this standard. ● Consider opportunities to explore current local and global issues related to this standard.
4-LS1.A.1	Evaluate: Assess	1 Day	● CER (Must Do), Multiple Choice, and Open-Ended Response

Topic 2: Sense Receptors

Suggested Length of Time: 7 Days

Essential Questions (Student Wondering):

- What do an animal's unique parts have to do with its survival?

Enduring Understanding (Learning Objectives):

- The student is expected to 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.

Standards Addressed

Missouri Learning Standards

- 4.LS1.D.1 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.

Priority (Disciplinary Core Ideas):

- 4. LS1.D.1 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.

Supporting (CC & SEP):

- Systems and System Models → System Description: A system can be described in terms of its components and their interactions.
- Developing and Using Models → Use of Models: Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.

Detailed Description/Instructions:

Standard/ CC	5E Model:	Suggested # of Days	Notes
			● Watch Setup Video. ● Prepare for the unit by requesting empty toilet paper rolls and water bottles. ● Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
	Engage: Investigative Phenomena		How do the senses help organisms respond to different things?
4.LS1.D.1	Engage: Accessing Prior Knowledge	½ day	● During this lesson students should use background knowledge to predict which sense would be the most important if they were a bat. ● By the end of this lesson students should be able to
4.LS1.D.1	Engage: Hook	½ day	● During this lesson students will explore how people react to smell differently. ● Prepare film canisters prior to lesson
4.LS1.D.1 (CC Cause & Effect)	Explore 1: Activity-Reactive Senses	1 day to Explore	● By the end of this lesson students should be able to describe how different forms of communication help animals survive.

	Students will take the role of gangs of meerkats to observe how different forms of communication help animals to survive.	1 day for C.E.R.	• See STEMcoach within the lesson guide for tips. • Read Procedures and Facilitation Points. • CC: A decrease in the number of meerkats would have an effect on the ecosystem.
4.LS1.D.1 (CC Cause & Effect)	Explore 2: Engineering Solutions- Sensing Danger Students will use the scientific knowledge they have gained as well as the 21st Century Skill of collaboration to design and construct an animal and identify ways it will sense and respond to danger.	1 day for Design 1 day for Explore	• By the end of this lesson students should be able to describe different ways animals can sense and respond to danger. • Providing the Sensing Danger rubric to highlight enduring understandings of this Engineering Solution. • CC: An animal's sense receptors, perceptions, and memories cause it to respond to dangers in a particular way.
4.LS1.D.1	Explain: STEMscopedia Picture Vocabulary Strategy: Students will write "What am I? riddles to review vocabulary terms."	1 Day	• Use graphic organizer under Engage dropdown menu to support learning. • By the end of this lesson students should connect the engage and explore activities to science standards.
4.LS1.D.1	Elaborate: Teacher Choice 	If time allows	• By the end of the lesson students should be able to connect science standards to the real world. • Additional Elaborate activities are optional per teacher choice and student needs. • Elaborate activities could be taught through a science workshop model with centers. • Consider opportunities to digitally connect with experts and community members on topics related to this standard. • Consider opportunities to explore current local and global issues related to this standard.
4.LS1.D.1	Evaluate: Assess	1 Day	• CER (Must Do), Multiple Choice and Open-Ended Response

Unit 2: Physical Science Part 1

Subject: Science

Grade: 4th

Name of Unit: Physical Science

Time per Day: 30 Minutes (approximately)

Length of Unit: 12-13 Days

Overview of Unit: Students experience the science of non-living things through relating the speed of an object to the energy of that object, making observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents, asking questions and predicting outcomes about the changes in energy that occur when objects collide, applying scientific ideas to design, test, and refining a device that converts energy from one form to another.

Materials for the Engaging Scenario: The student's mission is to develop an electrical warning system to alert astronauts on a spaceship of potential asteroid collisions.

Printed

1 Mission Log (per student or group)

1 Action Plan (per student or group)

Consumable

1 Sheet of paper (per student or group)

Reusable Pencil (per student or group)

Topic 1: Energy and Speed

Suggested Length of Time: 5 Days

Essential Questions (Student Wondering):

How is the speed of a moving object related to the energy it has to transfer to another object?

Enduring Understanding (Learning Objectives):

- The student is expected to use evidence to construct an explanation relating the speed of an object to the energy of that object.

Standards Addressed

Missouri Learning Standards:

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

Priority (Disciplinary Core Ideas):

- 4-PS3.A.1 *Definitions of Energy: The faster a given object is moving, the more energy it possesses.*

Supporting (Crosscutting Concepts (CC) and Science and Engineering Practices (SEP):

- Energy: Energy can be transferred in various ways and between objects.
- Constructing Explanations and Designing Solutions → Use Evidence: Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or to design a solution to a problem.

Detailed Description/Instructions:

Standard and CC	5E Model	Suggested # of Days	Notes:
			• Read the Teacher Background section (located under “Home”). • Watch Setup Video. • Read Common Misconceptions • Consider how you will structure science labs and journals. When moving through the first Scope, take time to teach these components. • Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
	Engage: Investigative Phenomena		How is the speed of a moving object related to the energy it has to transfer to another object?
P-PS.3.A.1	Engage: Assess Prior Knowledge	½ Day	• During this lesson students should use background knowledge to predict what will happen to the speed of an object if the energy acting on the object is increased. • Teaching Tips: 3-Corners, Turn and Talk
4-PS.3.A.1 (CC) Evidence	Engage: Hook	½ Day	• By the end of this lesson students should determine in which trial they used the most and least amount of energy. • This lesson requires a large, open space (outside, gym, cafeteria). • May be adjusted to be done as a whole group instead of multiple, smaller groups in order to save time.
4-PS.3.A.1 (CC) Energy)	Explore 1: Scientific Investigation- Racing for Distance Students will investigate how the height of a ramp affects the distance an	1 Day to Explore 1 Day for C.E.R.	• By the end of this lesson students should know that the amount of energy changes depending on the amount of energy transferred into a system. • Consider mid-lesson teaching points to support students’ with measurement and data collection procedures. • This will be students’ first experience with

	object travels as well as the sound produced when two objects collide.		CER. Spend time facilitating conversations when completing. ● CC: Students can explain how potential energy is being transferred to kinetic energy as the car rolls down the ramp.
4-PS.3.A.1 (CC Energy)	Explore 2: Activity- Creepy Crawlers In this activity, students will construct a climber and observe and record how speed and energy are related.	2 Days Optional	● By the end of this lesson students should be able to collaborate to solve a scientific problem. ● This is the first time students experience the Engineering Design Process. Consider how you will launch this. ● Reference the Disciplinary Core Ideas, Crosscutting Concepts, and Science and Engineering Practices to clarify their connection to this lesson. ● CC: Students can understand how speed and energy are related.
4-PS.3.A.1	Explain: STEMscopedia Picture Vocabulary Strategy: Students will use vocabulary words while writing a story with a partner.	1 Day	● Use graphic organizer under Engage dropdown menu to support learning. ● By the end of this lesson students should connect the engage and explore experiences to the standard. ● Could be done whole group, individually, or small groups. ● Consider what reading strategies you want students to practice during this reading. This is a longer text, so consider the jigsaw method within the group. ● Could be printed in packets, booklets, or assigned digitally. ● Decide if students will complete the “Try Now”.
	Explain/Elaborate: Teacher Choice 	If time allows.	● By the end of this lesson students should connect science content to the real world. ● Recommendation: Career Connection, Science Today-Watch it, and Concept Review Game ● Elaborate activities could be taught through a science workshop model with centers. ● Consider opportunities to digitally connect with experts and community members on

			topics related to this standard. Consider opportunities to explore current local and global issues related to this standard.
4-PS.3.A.1	Evaluate:	1 Day	Claim-Evidence- Reasoning (CER); Multiple Choice and/or Open-Ended Response Assessment

Topic 2: Energy Transfer and Electric Currents

Suggested Length of Time: 7-8 Days

Essential Questions (Student Wondering):

- How does energy move from one place to another?

Enduring Understanding (Learning Objectives):

- The student is expected to make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- The student is expected to apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Standards Addressed

Missouri Learning Standards:

- 4.PS3.B1 Provide evidence to construct an explanation of an energy transformation (e.g. temperature change, light, sound, motion, and magnetic effects)

Priority (Disciplinary Core Ideas):

- 4-PS3.A.2 Definitions of Energy: Energy can be moved from place to place by moving objects or through sound, light, or electric currents.
- 4-PS3.B.1 Conservation of Energy & 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.

Supporting (CC & SEP)::

- Asking Questions and Defining Problems → Investigate and Predict: Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause-and-effect relationships (4-PS3-3).
- Planning and Carrying Out Investigations → Phenomenon Explanations: Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution (4-PS3-2).
- Energy: Energy can be transferred in various ways between objects (4-PS3-1; 4-PS3-2; 4-PS3-3; 4-PS3-4).

Detailed Description/Instructions:

Standard/ CC	5E Model	Suggested # of Days	Notes:
	Engage: Investigative Phenomena		• Watch Setup Video. • Read the Teacher Background section (located under “Home”). • Read Common Misconceptions. • Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
4-PS3.A.2 4-PS3.B.1	Engage: Accessing Prior Knowledge (APK)	½ Day	• During this lesson students should use their background knowledge to predict what happens to the energy of an object when it collides with another object. • Teaching Tips: 3 Corners, Turn and Talk • Model Claim-Evidence-Reasoning thinking out loud for students.
4-PS3.A.2; 4-PS3.B.1	Engage: Hook	½ Day	• By the end of this lesson students should be able to describe what type of energy different objects give us. • Conclude with think, pair, share to reflect on new learning. • Correct any new misconceptions during share.
4-PS3.A.2; 4-PS3.B.1 (CC Energy)	Explore 1: What’s the Buzz Students explore how energy works by using batteries to make a lightbulb light up and make a buzzer sound.	1 Days to Explore 1 Day for C.E.R	• By the end of this lesson, students should be able to explain how a battery causes a buzzer to sound. • See STEMcoach within the lesson guide for tips. • Additional support found in lesson guides under ELL Strategy and Intervention Strategies.
	Explore 2: Engineering Solution-All the Bells and Whistles Students will use the scientific knowledge	2-3 Days	• By the end of this lesson, students should be able to explain how we convert stored energy into many different types of energy. • Possible way to break up this lesson.

	they gained as well as the 21st century skill of collaboration to design a booth that has many examples of electrical energy being transferred to other forms of energy.		○ Day 1: Present problem, challenge, criteria and constraints, and the engineering design process. ○ Day 2: Groups complete their designs and share with the class.. ○ Day 3 Optional: Groups refine and redesign based on teacher feedback.
4-PS3.A.2; 4-PS3.B.1	Explain: STEMscopedia Picture Vocabulary Strategy: Connect Four	1 Day	● Use graphic organizer under Engage dropdown menu to support learning. ● By the end of this lesson students should be able to connect and engage and explore the content vocabulary. ● Could be done whole group, individually, or small groups. ● Could be printed in packets, booklets, or assigned digitally.
	Elaborate: Teacher Choice 	If time allows.	● Optional per teacher choice and student needs. ● By the end of these lessons students should connect science content to the real world. ● Elaborate activities could be taught through a science workshop model with centers. ● Consider opportunities to digitally connect with experts and community members on topics related to this standard. ● Consider opportunities to explore current local and global issues related to this standard.
4-PS3.A.2; 4-PS3.B.1	Evaluate:	1 Day	● Claim-Evidence- Reasoning (CER); Multiple Choice and/or Open-Ended Response Assessment

Unit 3: Physical Science Part 2

Subject: Science

Grade: 4th

Name of Unit: Physical Science

Time per Day: 30 Minutes Minimum

Length of Unit: 16-17 Days

Overview of Unit: Students experience the science of non-living things through developing a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move, developing a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move and developing a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

Materials for Engaging Scenario: The student's mission will be to create an emergency signaling system, and show how it interacts with the eye or ear.

Printed

1 Mission Log (per student or group)

1 Action Plan (per student or group)

Consumable

Several sheets of white paper (per student or group)

2–3 Sheets of cellophane, various colors (per student or group)

2–3 Sheets of construction paper, various colors (per student or group)

Reusable

Assorted markers, various colors (per student or group)

1 Flashlight (per student or group)

1 Electronic tablet or computer (per student or group)

Topic 1: Motion of Waves

Suggested Length of Time: 5 Days

Essential Questions (Student Wondering):

- How do waves cause objects to move?

Enduring Understanding (Learning Objectives):

- The student is expected to develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

Standards Addressed

Missouri Learning Standards:

- 4.PS4.A.1 Develop a model of waves to describe patterns in terms of amplitude or wavelength and that waves can cause objects to move.

Priority (Disciplinary Core Ideas):

- 4. PS4.A.1 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.

Supporting (CC & SEP)::

- 4. PS4.A.3-5 Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products.
- 4. PS4.A.3-5 Developing and Using Models → Develop a model: Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.

Detailed Description/Instructions:

Standard/ CC	5E Model:	Suggested # of Days	Notes: • Watch Setup Video • Read the Teacher Background section. • Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
	Engage: Investigative Phenomena		How do waves cause objects to move?
4.PS4.A.1	Engage: Accessing Prior Knowledge	½ day	• Note the Intervention strategy at the end of the lesson. • By the end of this lesson students should be able to find the wrong sentences in the chart and make any changes needed to make them correct.
4.PS4.A.1	Engage: Hook	½ day	• By the end of this lesson students should be able to observe and discuss motion by working with a metal spring. • Note the ELL strategy at end of lesson; using the dowel may not be necessary for students to observe waves
4.PS4.A.1 (CC Similarities and Differences)	Explore 1: Activity-Disturbing Water Students observe how waves are created and their pattern of movement.	1 day to Explore 1 day for C.E.R.	• By the end of this lesson, students should be able to observe the movement of waves and water by dropping objects and causing waves. • Use the Master Materials List to verify which materials are present or need to be obtained. • See STEMcoach (multiple) within the lesson guide for tips. • CC: Similarities and differences are observed when dropping a penny,

			marble, and tennis ball into still water.
4.PS4.A.1	Explain: STEMscopedia Picture Vocabulary Strategy: In this activity, students will create concept maps connecting all the vocabulary words from the scope.	1 Day	• Use graphic organizer under Engage dropdown menu to support learning. • By the end of this lesson students should be able to connect the engage and explore activities to the scope standard.
4.PS4.A.1	Elaborate: Teacher Choice 	If Time Allows	• Additional Elaborate activities are optional per teacher choice and student needs. • Elaborate activities could be taught through a science workshop model with centers. • By the end of this lesson students should be able to connect the science content to the real world. • Consider opportunities to digitally connect with experts and community members on topics related to this standard. • Consider opportunities to explore current local and global issues related to this standard.
4.PS4.A.1	Evaluate: Assess	1 Day	• Concept Attainment Quiz and/or CER • Same standard assessed in next unit

Topic 2: Wavelength and Amplitude

Suggested Length of Time: 5-6 Days

Essential Questions (Student Wondering):

- How can we predict where an earthquake will cause the most damage?

Enduring Understanding (Learning Objectives):

- The student is expected to develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

Standards Addressed

Missouri Learning Standards:

- 4.PS4.A.1 Develop a model of waves to describe patterns in terms of amplitude or wavelength and that waves can cause objects to move.

Priority (Disciplinary Core Ideas):

- 4-PS4.A.2 Wave Properties: Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).

Supporting (CC & SEP)::

- Patterns → Similarities and Differences: Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena and designed products.
- Developing and Using Models → Develop a Model: Develop a model using an analogy, example, or abstract representation to describe a scientific principle or design solution.

Detailed Description/Instructions:

Standard/ CC	5E Model:	Suggested # of Days	Notes:
			• Watch Setup Video. • Read the Teacher Background section. • Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
	Engage: Investigative Phenomena		How do amplitude and wavelength affect the motion of objects?
4-PS4.A.2	Engage: Accessing Prior Knowledge	½ day	• During this lesson students should use background knowledge to predict which wave provided the longest wavelength. • Note the ELL strategy at the end of lesson.
4.PS4.A.2	Engage: Hook	½ day	• During this lesson students should explore the movement of waves. • Recommend to not use the rubber bands; have students “pop” with light taps of their hand. • Note the ELL strategy at the end of the lesson.

4.PS4.A.2 (CC Similarities and Differences)	Explore 1: Activity-Wave Challenge Students will use a model to observe amplitude and wavelength.	1 day	- During this lesson students should explore the movement of waves. - See STEMcoach (multiple) within the lesson guide for tips. - CC: There are similarities and differences in the motion and pattern of waves.
4.PS4.A.2 (CC Similarities and Differences)	Explore 2: Activity-Waves and Motion Students will investigate how wavelength and amplitude affect the motion of objects.	1-2 Days	- By the end of this lesson, students should be able to explain how to change the patterns of waves in water. - Use the Master Materials List to verify which materials are present or need to be obtained. - Use pingpong balls instead of balloons due to allergies. - See STEMcoach (multiple) within the lesson guide for tips. - Use the Master Materials List to verify which materials are present or need to be obtained. - See STEMcoach (multiple) within the lesson guide for tips.
4.PS4.A.2 (CC Similarities and Differences)	Explore 3: Engineering Solution-Waves in the Earth Students will use the scientific knowledge they have gained as well as the 21st Century Skill of collaboration to design and construct a simple seismograph	2-3 Days Optional	- By the end of this lesson students should collaborate with a team to solve a science problem. - By the end of this lesson students should measure waves from a simulated earthquake and then design a solution for buildings that are in areas prone to earthquakes. - Consider how you will review Expert Roles. - Consider Criteria and Constraints - Note the ELL strategy at the end of the lesson. - CC: All seismic waves cause Earth's crust to move, but the strength and effects may be different.
4.PS4.A.2	Explain: STEMscopedia Picture Vocabulary Strategy:	1 Day	- By the end of this lesson students should be able to connect and engage and explore content standards. - Use graphic organizer under Engage

	In this activity, students will write acrostic poems to review vocabulary terms.		dropdown menu to support learning.
4.PS4.A.2	Elaborate: Teacher Choice 	If Time Allows	- By the end of this lesson students should be able to connect science content to the real world. - Additional Elaborate activities are optional per teacher choice and student needs. - Elaborate activities could be taught through a science workshop model with centers. - Consider opportunities to digitally connect with experts and community members on topics related to this standard. - Consider opportunities to explore current local and global issues related to this standard.
4.PS4.A.2	Evaluate: Assess	1 Day	CER (Must Do), Multiple Choice, and/or Open-Ended Response

Topic 3: Light Reflection

Suggested Length of Time: 6 Days

Essential Questions (Student Wondering):

- How are we able to see things?

Enduring Understanding (Learning Objectives):

- The student is expected to develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

Standards Addressed

Missouri Learning Standard:

- 5.PS4.A.1 Develop a model to describe that objects can be seen only when light is reflected off them when they produce their own light.

Priority (Disciplinary Core Ideas):

- 4-PS4.B.1 Electromagnetic Radiation: An object can be seen when light reflected from its surface enters the eyes.

Supporting (CC & SEP):

- Cause and Effect: Cause-and-effect relationships are routinely identified, tested, and used to explain change

- Developing and Using Models → Predict Phenomena: Develop and/or use models to describe and/or predict phenomena.

Detailed Description/Instructions:

Standard/ CC	5E Model:	Suggested # of Days	Notes
			• Watch Setup Video. • Prepare for the unit by requesting empty toilet paper rolls, empty paper towel rolls, and empty water bottles. • Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
	Engage: Investigative Phenomena		How are we able to see things?
4-PS4.B.1	Engage: Accessing Prior Knowledge	½ day	• By the end of this lesson students should be able to decide what recycled material would be better to prevent light from entering a window.
4-PS4.B.1	Engage: Hook	½ day	• By the end of this lesson students should be able to explain how they see things because light bounces off objects and comes back to our eyes.
	Explore 1: Activity- Bull's-Eye! In this activity, students will investigate reflection and how light travels to reflect a light beam around the room in an attempt to hit a bulls-eye in the least amount of time.	2 Days to Explore 1 Day for C.E.R	Preparation Copy one bull's-eye target for each group Label bulls-eyes specifically for each group. Hang one bulls-eye per group somewhere in the room. With the masking tape, mark one starting point on the floor per group. Label starting points specifically for each group. Copy the Student Journal: Bulls-Eye! for each student. Place students in groups of four.
	Explore 2: Activity- Let There Be Light! In this activity, students will observe objects with and without light to determine which is easier to see.	Optional	Preparation Copy one Student Journal for each student. You will need enough shoe boxes for each group of two students to have one. You could ask students to bring in shoe boxes a few days prior to the activity until you have enough. Use scissors or a utility knife to carefully cut a hole into the side of each shoe box. The hole should be about 1 inch in

			diameter. Place a small figurine inside each shoe box and cover each box with a lid.
	Explore 3: Engineering Solution: Periscope	Optional	Preparation Have all materials ready and separated by group for easy distribution. Keep the small objects hidden until the activity begins. Put up a folder to create a “wall” on the group’s desk. Make a copy of the Periscope for each student.
4-PS4.B.1	Explain: STEMscopedia Picture Vocabulary Strategy: Students will use vocabulary words while writing a story with a partner.	1 Day	- By the end of this lesson students should be able to connect and engage and explore content standards. - Use with graphic organizer under Engage dropdown menu to support learning.
4-PS4.B.1	Elaborate: Teacher Choice 	If Time Allows	- Additional Elaborate activities are optional per teacher choice and student needs. - Elaborate activities could be taught through a science workshop model with centers. - By the end of this lesson students should be able to connect, engage and explore the real world. - Consider opportunities to digitally connect with experts and community members on topics related to this standard. - Consider opportunities to explore current local and global issues related to this standard.
4-PS4.B.1	Evaluate: Assess	1 Day	CER (Must Do), Multiple Choice, and/or Open-Ended Response

Unit 4: Earth and Space Science

Subject: Science

Grade: 4th

Name of Unit: Earth and Space Science

Length of Unit: 22-23 Days

Overview of Unit: Students experience the sciences that deal with the origin, composition, and physical features of the Earth through identifying evidence from patterns in rock formations and

fossils in rock layers to support an explanation for changes in a landscape over time, making observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation, making observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation, analyzing and interpreting data from maps to describe patterns of Earth's features.

Materials necessary for Engaging Scenario: The student's mission is to create an ad to attract new workers to a coal-mining project

Printed

1 Mission Log (per student or group)

1 Action Plan (per student or group)

Consumable

1 Large piece of paper (per student or group)

Reusable

Colored pencils, markers, crayons (per student or group)

Topic 1: Rock Patterns

Suggested Length of Time: 6 Days

Essential Questions (Student Wondering):

- If environments change so slowly, how can we know what they used to be like?

Enduring Understanding (Learning Objectives):

- The student is expected to identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

Standards Addressed

Missouri Learning Standards:

- 4.ESS1.C.1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

Priority (Disciplinary Core Ideas):

- 4-ESS1.C.1 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.

Supporting (CC & SEP):

- Constructing Explanations and Designing Solutions → Identify Evidence: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
- Evidence → Patterns can be used as evidence to support an explanation.

Detailed Description/Instructions:

Standard/CC	5E Model:	Suggested # of Days	Notes
			● Watch Setup Video. ● Prepare for the unit by purchasing orange juice, carbonated soft drink,

			cocoa powder, orange sprinkles, pretzels, and puffed rice cereal. Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
	Engage: Investigative Phenomena		If environments change so slowly, how can we know what they used to be like?
4-ESS1.C.1	Engage: Accessing Prior Knowledge	½ Day	By the end of this lesson students should be able to think about and share what causes landscapes to change.
4-ESS1.C.1	Engage: Hook	½ Day	By the end of this lesson students should be able to make and share observations based on what they see in the rock formations of the Grand Canyon.
4-ESS1.C.1 (CC Evidence)	Explore 1: Activity-Rock Layers In this activity, students will observe fossil evidence in layers of clay to see what kinds of events affect the layers of Earth.	1 Day to Explore 1 Day for C.E.R.	- Consider teacher modeling rather than students in groups. - Multi-day preparation involved. - Use the Master Materials List to verify which materials are present or need to be obtained. - By the end of this lesson students should be able to observe core layers to see what kind of events affect the layers of Earth. - CC: Students can use patterns as evidence to support their explanations of which layer is the most recent and what that layer tells us.
4-ESS1.C.1 (CC Evidence)	Explore 2: Activity-Earthquake! Students will observe how an earthquake causes changes in the pattern of rock formations.	1 Day	Preparation Fill a container with two sheets of wax paper, three colors of modeling clay, a plastic knife, and a paper plate for each group. Safety: Ensure that all safety procedures become second nature to students. Practice makes perfect!

4-ESS1.C.1	Explain: STEMscopedia Vocabulary Strategy Students will participate in a conversation using vocabulary words from the scope.	1 Day	- By the end of this lesson students should connect the engage and explore activities to science standards. - Use with graphic organizer under Engage dropdown menu to support learning.
4-ESS1.C.1	Elaborate: Teacher Choice 	If Time Allows	- Additional Elaborate activities are optional per teacher choice and student needs. - Elaborate activities could be taught through a science workshop model with centers. - By the end of these lessons students should connect the engage and explore activities to the real world. - Consider opportunities to digitally connect with experts and community members on topics related to this standard. - Consider opportunities to explore current local and global issues related to this standard.
4-ESS1.C.1	Evaluate: Assess	1 Day	CER (Must Do), Multiple Choice, and Open-Ended Response

Topic 2: Changing Land

Suggested Length of Time: 11-12 Days

Essential Questions (Student Wondering):

[How do landforms change over time?](#)

Enduring Understanding (Learning Objectives):

- The student is expected to make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Standards Addressed

Missouri Learning Standards:

- 4.ESS2.A.1 Plan and conduct scientific investigations or simulations to provide evidence how natural processes (e.g. weathering and erosion) shape Earth's Surfaces.

Priority (Disciplinary Core Ideas):

- 4-ESS.2.A.1 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.

Supporting (CC & SEP):

- Planning and Carrying Out Investigations→ Phenomenon Explanations: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- Cause and Effect → Cause and effect relationships are routinely identified, tested, and used to explain change

Detailed Description/Instructions:

Standard/ CC	5E Model:	Suggested # of Days	Notes
	Engage: Investigative Phenomena		How do landforms change over time?
4-ESS.2.A.1	Engage: Accessing Prior Knowledge	½ day	● Watch Setup Video ● During this lesson students should use background knowledge to predict why some rocks are different from others. ● Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
4-ESS.2.A.1	Engage: Hook	½ day	● By the end of this lesson students should be able to compare the breakdown of objects based on different methods.
4-ESS2-1 (CC Cause and Effect)	Explore 1: Scientific Investigation- Waves on the Beach Students investigate and observe the effects of waves on the beach.	1 day to Explore 1 day for C.E.R.	● By the end of this lesson students should be able to describe the effects of waves on the beach. ● Internet search of <i>Collaroy Narrabeen Beach Erosion Time Lapse</i> ● CC: Students can make cause/effect relationships for how the beach changed as they made waves.
4-ESS2-1	Explore 2: Activity-	1-2 Days	● By the end of this lesson students

(CC Cause and Effect)	What Processes Can Change Land? Students will create models to demonstrate the processes that can change Earth's surface.		should be able to describe the effects of wind, ice, erosion. • Use the Master Materials List to verify which materials are present or need to be obtained. • CC: Students can make cause/effect relationships for how the wind changed the land. Preparation • The first three parts of this activity work well as stations. The materials list reflects one set of stations. For larger classes, consider doubling the materials and having two sets of stations going at the same time while each group rotates between one set of three stations. Print a set of Station Cards, cut them out, and place each card at each station. Part IV should not be done until after each group has visited each station.
4-ESS2-1	Explore 3: Scientific Investigation- Rushing Water Students investigate and observe the rate of water erosion as the slope of the area changes.	3-4 days to Explore 1 day for C.E.R.	• By the end of this lesson students should create and present a prototype that slows down or stops soil erosion caused by water over hilly farmland or wind over flat farmland. • Review Expert Roles • 21st Century Skill Addressed: Presentation • CC: Students will be able to identify cause/effect relationships as they create prototypes for solutions to prevent the erosion of soil from farmland.
	Explore 4: Activity- Agents of Weathering and Erosion Students identify the agents of weathering and erosion by sorting cards into the proper category.	Optional	Printed Material 1 Agents of Weathering and Erosion Cards set (per student or group) 1 Sorting Mat (per student or group) Reusable 1 Resealable plastic sandwich bag (per student or group) Preparation Cut each set of Agents of Weathering and Erosion Picture Cards apart and place one set in each of the resealable plastic sandwich bags.

4-ESS.2.A.1	Explain: STEMscopedia Picture Vocabulary Strategy: In this activity, students will play a relay game to win points by reviewing vocabulary terms.	1 Day	- By the end of this lesson students should connect the engage and explore activities to science standards. - Use with graphic organizer under Engage dropdown menu to support learning.
4-ESS.2.A.1	Elaborate: Teacher Choice 	If Time Allows	- By the end of this lesson students should connect the engage and explore activities to the real world. - Additional Elaborate activities are optional per teacher choice and student needs. - Elaborate activities could be taught through a science workshop model with centers. - Consider opportunities to digitally connect with experts and community members on topics related to this standard. - Consider opportunities to explore current local and global issues related to this standard.
4-ESS.2.A.1	Evaluate: Assess	1 Day	CER (Must Do), Multiple Choice, and Open-Ended Response

Topic 3: Plate Tectonics

Suggested Length of Time: 5 Days

Essential Questions (Student Wondering):

[What causes the patterns of Earth's features?](#)

Enduring Understanding (Learning Objectives):

- The student is expected to analyze and interpret data from maps to describe patterns of Earth's features.

Standards Addressed

Missouri Learning Standards

- 4.ESS2.B.1 Analyze and interpret data from maps to describe patterns of Earth's features.

Priority (Disciplinary Core Ideas):

- 4-ESS2.B.1 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 in areas of Earth.

Supporting (CC & SEP)::

- Patterns → Evidence: Patterns can be used as evidence to support an explanation.
- Analyzing and Interpreting Data → Analyze and Interpret Data: Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.

Detailed Description/Instructions:

Standard and CC	5E Model:	Suggested # of Days	Notes ● Watch Setup Video ● Preview picture vocabulary to match the vocabulary terms with the associated lessons (teach vocabulary in context).
	Engage: Investigative Phenomena		What causes the patterns of Earth's features?
4.ESS2.B.1	Engage: Accessing Prior Knowledge	½ day	● By the end of this lesson students should be able to think and share about the continents and about which student statement they agree with the most.
4.ESS2.B.1	Engage: Hook	½ day	● By the end of this lesson students should be able to observe, compare, and describe landforms shown on a map.
4.ESS2.B.1 (CC Patterns/ Evidence)	Explore 1: Activity- Patterns in Land Mystery Science: Could a Volcano Pop Up Where You Live? (Lesson resources are in Schoology: Coaches Corner- Science folder)	1 day	● By the end of this lesson students should be able to use maps to make connections between the edges of tectonic plates and the location of certain landforms. ● CC: Students can use patterns as evidence to explain the relationship between plate boundaries and landforms. (You will need to go to the Mystery Science website to print some of the resources.)
4.ESS2.B.1 (CC Patterns/ Evidence)	Explore 2: Activity- Tectonic Plates In this activity, students	1 Day	● Claim-Evidence-Reasoning ● By the end of this lesson students should be able to explain plate movement and resulting landforms on Earth.

	will use graham crackers and marshmallow fluff to model plate movement and resulting landforms on Earth.		CC: Students can present evidence to justify their results.
	Explore 3: Tuva-Volcanoes Around the World Students will describe where most volcanoes and earthquakes occur.	Optional	Printed Material 1 Volcanoes around the World (per student) Reusable Material 1 Computer (per student or group) 1 Red crayon or marker (per student) 1 Black crayon or marker (per student) Preparation Print the copy of Volcanoes around the World for each student. Plan to allow students to work at computers either individually or in small groups. It is recommended to not have more than three students per computer.
4.ESS2.B.1	Explain: STEMscopedia Picture Vocabulary Strategy: Students will play a game similar to the popular game Guess Who? to review vocabulary terms.	1 Day	- By the end of this lesson students should connect the engage and explore activities to science standards. - Use with graphic organizer under Engage dropdown menu to support learning.
4.ESS2.B.1	Elaborate: Teacher Choice 	If Time Allows	- Additional Elaborate activities are optional per teacher choice and student needs. - Elaborate activities could be taught through a science workshop model with centers. - By the end of this lesson students should connect the engage and explore activities to the real world. - Consider opportunities to digitally connect with experts and community members on topics related to this standard. - Consider opportunities to explore current local and global issues related to this standard.
4.ESS2.B.1	Evaluate: Assess	1 Day	CER (Must Do), Multiple Choice, and Open-Ended Response

Revisions May 2023:

- Removed the Light Reflection scope from 3rd/4th quarter.
- Added resources for a Mystery Science lesson about volcanoes into our Plate Tectonics scope.

- Number of days for each scope were readjusted in our pacing guide as needed.
- Assessments are carefully aligned to Missouri Learning Standards.