Middle School 7th Grade Science Curriculum

Course Description: Students will engage in units related to three core areas in science: matter and energy, Earth’s processes, and living things. Throughout the units, students will develop models to describe their learning, construct scientific explanations based on evidence, analyze and interpret data and evidence, and construct, test, and modify a device to illustrate concepts.

Scope and Sequence:

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<td>Topic 5: Human Influence on Traits</td>
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Unit 1: Waves

Subject: Science
Grade: 7
Name of Unit: Waves
Length of Unit: 20-25 days

Overview of Unit: Students will use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. Students will develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Priority Standards for unit:
- 6-8-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.]
- 6-8-PS4 -2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.]

Supporting Standards for unit:
- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- ISTE-EMPOWERED LEARNER 1: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

<table>
<thead>
<tr>
<th>Unwrapped Concepts (Students need to know)</th>
<th>Unwrapped Skills (Students need to be able to do)</th>
<th>Bloom’s Taxonomy Levels</th>
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<tr>
<td>Mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.</td>
<td>Use</td>
<td>Understand</td>
<td>2</td>
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<tr>
<td>A model to describe that waves are reflected, absorbed, or transmitted through various materials.</td>
<td>Develop</td>
<td>Create</td>
<td>3</td>
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<tr>
<td>A model to describe that waves are reflected, absorbed, or transmitted through various materials.</td>
<td>Use</td>
<td>Understand</td>
<td>2</td>
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</table>
**Essential Questions:**
1. How would a wave behave when it interacts with a new medium?
2. How do we measure the characteristics of waves?

**Enduring Understanding/Big Ideas:**
1. A wave will reflect, absorb, or transmit when it interacts with a new medium.
2. A wave can be measured by its frequency, wavelength, and amplitude.

**Unit Vocabulary:**

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<tr>
<th>Academic Cross-Curricular Words</th>
<th>Content/Domain Specific</th>
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<tr>
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<td>Frequency</td>
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<td>Wavelength</td>
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<td>Amplitude</td>
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<td>Electromagnetic spectrum</td>
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<td>Wave</td>
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<td>Reflect</td>
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<td>Absorb</td>
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<td>Transmit</td>
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<td>Mechanical waves</td>
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<td>Light</td>
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**Resources for Vocabulary Development:**
- Introduction to Properties of Waves Scope
- Modeling Waves through Various Mediums Scope
- Properties of Visible Light Scope
- Modeling Electromagnetic Waves Scope
**Topic 1: Introduction to Properties of Waves**

**Engaging Experience 1**

**Title:** Introduction to Properties of Waves Scope - Engage: Hook

**Suggested Length of Time:** 15-30 minutes

**Standards Addressed**

*Priority:*

- 6-8-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.]

*Supporting:*

- ISTE-EMPOWERED LEARNER 1: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

**Detailed Description/Instructions:** See Introduction to Properties of Waves Scope - Engage: Hook. Students brainstorm to make a list of types of waves and technologies that uses waves.

**Bloom’s Levels:** Remember

**Webb’s DOK:** 1

**Engaging Experience 2**

**Title:** Measuring Wave Properties Activity

**Suggested Length of Time:** 1 hour

**Standards Addressed**

*Priority:*

- 6-8-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.]

*Supporting:*

- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

**Detailed Description/Instructions:** Students will identify and measure properties of waves.

https://docs.google.com/a/parkhill.k12.mo.us/document/d/1GT_2bZ22dG0kMnvUaj38mXdjiFFNg2CAI7EdcxN_rQE/edit?usp=sharing

**Materials:** Rope, Meter stick or ruler

- **Role #1:** Wave-maker — someone to actually move the rope flat on the floor, causing the waves.
a. To get warmed up, the wave-maker should start moving the rope back and forth across the floor. Keep the wave as consistent as possible. Try to keep the line of tape in the center of the waves the whole time.

- **Role #2: Timer & rope holder** – this person will use a stopwatch to time 10 seconds for the frequency (Role #3) AND hold the opposite end of the rope for the wave-maker (role #1).

- **Role #3: Frequency** – measure the frequency of the wave by placing your finger on a spot next to the wave, where you can easily see the crests or troughs passing. Count how many waves pass by your finger until the timer (role #2) tells you to stop, and divide that number by 10 to get the number of waves per one second.

- **Role #4: Measure:**
  a. Wavelength – once the wave has stopped, measure the wavelength (distance from one crest-crest or trough-trough) using a meter stick.
  b. Amplitude – once the wave has stopped, use a meter stick or ruler to measure the height of the wave from resting point (tape line) to the crest (top of one wave).

***Repeat these steps for two new waves, by creating a “fast” wave and a “slow” wave.***

**Bloom’s Levels:** Understand
**Webb’s DOK:** 2

**Engaging Experience 3**

**Title:** Introduction to Properties of Waves Scope - Explain: STEMScopedia

**Suggested Length of Time:** 1-2 hours

**Standards Addressed**

**Priority:**
- 6-8-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.]

**Supporting:**
- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

**Detailed Description/Instructions:** See Introduction to Properties of Waves Scope - Explain: STEMScopedia. Students will read information about properties of waves and assess their comprehension.

**Bloom’s Levels:** Understand
**Webb’s DOK:** 3
Engaging Experience 4
Title: Waves
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
- 6-8-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
  [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.]

Supporting:
- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Detailed Description/Instructions: Students will observe and measure the amplitude, wavelength, frequency, and speed of waves.

Bloom’s Levels: Understand
Webb’s DOK: 3

Engaging Experience 5
Title: Wave Properties Challenge
Suggested Length of Time: 15-20 minutes
Standards Addressed

Priority:
- 6-8-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
  [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.]

Supporting:
- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Detailed Description/Instructions: See https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B6riKJ3lJ5rTWlHTGJ3OERoZGM/view?usp=sharing
Students will draw a wave based on given measurements.

Bloom’s Levels: Apply
Webb’s DOK: 2
Topic 2: Behavior of Waves

Engaging Experience 1

Title: Mechanical Waves Require a Medium Demo

Suggested Length of Time: 20-30 minutes

Standards Addressed

Priority:
- 6-8-PS4 -2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.]

Supporting:
- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Detailed Description/Instructions: See Mechanical Waves Require a Medium. Students will observe sound with a bell jar and understand that mechanical waves require a medium. [Link to resource]

Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 2

Title: Cup Phones Activity

Suggested Length of Time: 20-30 minutes

Standards Addressed

Priority:
- 6-8-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.]

Supporting:
- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Detailed Description/Instructions: See Cup Phones Activity. [Link to resource]

Students will test various materials to determine which medium allows sound, a mechanical wave, to be transmitted the best.

Bloom’s Levels: Apply; Webb’s DOK: 2
Engaging Experience 3
Title: Light Through Various Materials Engaging Activity
Suggested Length of Time: 15-20 minutes

Standards Addressed

**Priority:**
- 6-8-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.]

**Supporting:**
- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

**Detailed Description/Instructions:** See Light Through Various Materials Engaging Activity https://docs.google.com/a/parkhill.k12.mo.us/document/d/1orVvfBWqTYUHyEQHGaN0tor7uKimSbeMyzcWXOrFqA/edit?usp=sharing

Students investigate interactions of visible electromagnetic waves with various materials, such as reflection, absorption, refraction, and transmission.

**Bloom’s Levels:** Analyze
**Webb’s DOK:** 3
Engaging Scenario

**Engaging Scenario** (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

**Title:** Waves Commercial

**Suggested Length of Time:** 3-5 days

**Standards Addressed**

*Priority*

- 6-8-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.]
- 6-8-PS4-2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.]

*Supporting*

- 6-8-ESTS-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- ISTE-EMPOWERED LEARNER 1: Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

**Detailed Description/Instructions:** Students work in pairs to write and film a commercial selling wave reflection, absorption, or transmission with the side effect of amplitude change.

https://drive.google.com/open?id=0B1cSc1ufGRBYSk5mTXdLZjRxC2M
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<th>Engaging Experience Title</th>
<th>Description</th>
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<td>Introduction to Properties of Waves Scope--Engage: Hook</td>
<td>See Introduction to Properties of Waves Scope - Engage: Hook. Students brainstorm to make a list of types of waves and technologies that uses waves.</td>
<td>15-30 min</td>
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<td>Introduction to Properties of Waves</td>
<td>Measuring Wave Properties Activity</td>
<td>Students will identify and measure properties of waves.</td>
<td>1 hour</td>
</tr>
<tr>
<td>Introduction to Properties of Waves</td>
<td>Introduction to Properties of Waves Scope--Explain: STEMScopedia</td>
<td>See Introduction to Properties of Waves Scope - Explain: STEMScopedia. Students will read information about properties of waves and assess their comprehension.</td>
<td>1-2 hours</td>
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<tr>
<td>Introduction to Properties of Waves</td>
<td>Waves</td>
<td>Students will observe and measure the amplitude, wavelength, frequency, and speed of waves.</td>
<td>1-2 hours</td>
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<td>Wave Properties Challenge</td>
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<td>Behavior of Waves</td>
<td>Mechanical Waves Require a Medium Demo</td>
<td>See Mechanical Waves Require a Medium. Students will observe sound with a bell jar and understand that mechanical waves require a medium.</td>
<td>20-30 min</td>
</tr>
<tr>
<td>Behavior of Waves</td>
<td>Cup Phones Activity</td>
<td>Students will test various materials to determine which medium allows.</td>
<td>20-30 min</td>
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</table>
Behavior of Waves | Light Through Various Materials Engaging Activity | Students investigate interactions of visible electromagnetic waves with various materials, such as reflection, absorption, refraction, and transmission. | 15-20 min
Unit 2: Space

Subject: Science
Grade: 7
Name of Unit: Space
Length of Unit: 50-55 days

Overview of Unit: This unit focuses on the role of gravity on the motions of objects in our solar system and galaxy. Another focus is on the cyclic patterns caused by the interactions of the Sun, Earth, and Moon.

Priority Standards for unit:

- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]
- 6-8-PS2-4 Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.]
- 6-8-ESS1-4 Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.]
- 6-8-ESS1-1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon. [Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.]
- 6-8-ESS1-2 Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

Supporting Standards for unit:

- ISTE - KNOWLEDGE COLLECTOR.3: Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
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<th>Unwrapped Concepts (Students need to know)</th>
<th>Unwrapped Skills (Students need to be able to do)</th>
<th>Bloom’s Taxonomy Levels</th>
<th>Webb's DOK</th>
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</thead>
<tbody>
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<td>The role of gravity in the motions within galaxies and the solar system.</td>
<td>Develop</td>
<td>Create</td>
<td>3</td>
</tr>
<tr>
<td>The role of gravity in the motions within galaxies and the solar system.</td>
<td>Use</td>
<td>Understand</td>
<td>2</td>
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<tr>
<td>Gravitational interactions depend on the mass of interacting objects.</td>
<td>Create</td>
<td>Create</td>
<td>3</td>
</tr>
<tr>
<td>Gravitational interactions depend on the mass of interacting objects.</td>
<td>Analyze</td>
<td>Analyze</td>
<td>4</td>
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<tr>
<td>Determine scale properties of objects in the solar system.</td>
<td>Analyze</td>
<td>Analyze</td>
<td>3</td>
</tr>
<tr>
<td>Determine scale properties of objects in the solar system.</td>
<td>Interpret</td>
<td>Analyze</td>
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<tr>
<td>Explain the cyclic patterns of lunar phases and eclipses of the sun and moon.</td>
<td>Develop</td>
<td>Create</td>
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<tr>
<td>Explain the cyclic patterns of lunar phases and eclipses of the sun and moon.</td>
<td>Use</td>
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<td>Explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year.</td>
<td>Develop</td>
<td>Create</td>
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<td>Explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year.</td>
<td>Use</td>
<td>Understand</td>
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**Essential Questions:**
1. How would the solar system be affected if the Sun were bigger? What if the Sun were smaller?
2. How do the planets stay in orbit?
3. How do we use scale models?
4. Why do lunar phases and eclipses occur?
5. Why do we have seasons?

**Enduring Understanding/Big Ideas:**
1. The mass of an object determines its strength of gravitational interaction, its distance from the Sun, and orbital periods.
2. The orbital path of an object is determined by its gravitational pull, centripetal forces, and inertia.
3. A scale model is a physical representation of an object, which maintains accurate relationships between all important aspects of the model to observe or demonstrate the properties of the original object without examining the original object itself.
4. The Earth-sun-moon system goes through cyclic patterns to create lunar phases and eclipses.
5. The Earth’s tilt and directional angle of sunlight on different areas of Earth across the year create seasons.

**Unit Vocabulary:**

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<td>Rotation</td>
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<td>Revolution</td>
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<td>Axis</td>
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<td>Celestial body</td>
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<td>Electromagnetic spectrum</td>
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<td>Centripetal force</td>
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<td>Solar system</td>
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<td>Lunar phases</td>
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<td>Eclipses</td>
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<td>Seasons</td>
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<td>Earth’s tilt</td>
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<td>Terrestrial</td>
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<td>Ellipse</td>
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<td>Astronomical Unit</td>
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**Resources for Vocabulary Development:**
The Solar System Scope
Formatting the Solar System Scope
The Universe Scope
Gravitational Forces Scope
Patterns of Motion Scope
Earth, Sun, and Moon Systems Scope
Geologic History of Earth Scope
Topic 1: The Solar System

Engaging Experience 1
Title: The Solar System Scope - Engage: Hook
Suggested Length of Time: 15-30 minutes
Standards Addressed

Priority:
- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]

Detailed Description/Instructions: See The Solar System Scope - Engage: Hook
Students brainstorm what they know about the solar system and how scientists gather information about it.
Bloom’s Levels: Remember
Webb’s DOK: 1

Engaging Experience 2
Title: Universe Analogies
Suggested Length of Time: 15 minutes
Standards Addressed

Priority:
- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]

Detailed Description/Instructions:
1. Create an analogy for the arrangement of the universe.
2. https://docs.google.com/document/d/1wG4v4VzwrBSL6-36E0Zb4hIdzXTFI/Gf_MEqAdHZKcs/edit?usp=sharing

Bloom’s Levels: Evaluate
Webb’s DOK: 4

Engaging Experience 3
Title: Structure of the Solar System notes
Suggested Length of Time: 1 hour
Standards Addressed
**Priority:**

- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]

**Detailed Description/Instructions:** Students will record information about the structure of the solar system. These notes are for scaffolding the structures of the solar system.

https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B1cSc1ufGRBYdUFOUEt0WXhDWGM/view?usp=sharing

**Bloom’s Levels:** Understand

**Webb’s DOK:** 2

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**Engaging Experience 4**

**Title:** The Universe Scope - Explain: STEMScopedia

**Suggested Length of Time:** 1 hour

**Standards Addressed**

**Priority:**

- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]

**Detailed Description/Instructions:** See The Universe Scope - Explain: STEMScopedia

Students will read information about the solar system and assess their comprehension.

**Bloom’s Levels:** Understand

**Webb’s DOK:** 3
Topic 2: The Role of Gravity in the Motions of Space

Engaging Experience 1
Title: The Universe Scope - Engage: Accessing Prior Knowledge activity
Suggested Length of Time: 15-20 minutes
Standards Addressed

Priority:

- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]

Detailed Description/Instructions: The Universe Scope - Accessing Prior Knowledge activity
In this activity, students choose the statement that most accurately describes the role of gravity in the motion within galaxies.

Bloom’s Levels: Understand
Webb’s DOK: 1

Engaging Experience 2
Title: The Solar System Scope - Explore Do 2: Activity
Suggested Length of Time: 1 hour
Standards Addressed

Priority:

- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]

Detailed Description/Instructions: See The Solar System Scope - Explore Do 2: Activity
Students make a model to show how objects interact in space as the result of gravity.

Bloom’s Levels: Create
Webb’s DOK: 3

Engaging Experience 3
Title: The Solar System Scope - Explore Do 1: Activity
Suggested Length of Time: 1 hour
Standards Addressed

Priority:

- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis
for the model is on gravity as the force that holds together the solar system and
Milky Way galaxy and controls orbital motions within them. Examples of models
can be physical or conceptual.]

**Detailed Description/Instructions:** See The Solar System Scope - Explore Do 1: Activity
Students demonstrate that systems in a dynamic equilibrium are stable due to a balance between
inertia and gravity by modeling an object’s revolution around another. Students use the model to
predict and describe events that would take place within the system if phenomena, such as
gravity or inertia, changes.

**Bloom’s Levels:** Understand
**Webb’s DOK:** 2

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**Engaging Experience 4**

**Title:** Gravity Pitch

**Suggested Length of Time:** 1 hour

**Standards Addressed**

**Priority:**

- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the
  motions within galaxies and the solar system. [Clarification Statement: Emphasis
  for the model is on gravity as the force that holds together the solar system and
  Milky Way galaxy and controls orbital motions within them. Examples of models
  can be physical or conceptual.]

**Detailed Description/Instructions:** Gravity Pitch simulation. Observe the path of the ball when
it is thrown at different velocities. Throw the ball on different planets to see how each planet's
gravity affects the ball.

**Bloom’s Levels:** Understand

**Webb’s DOK:** 3
Engaging Scenario 1

**Engaging Scenario** (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

**Title:** See The Solar System Scope - Evaluate: The Performance Expectation Assessment Task: PART 2

**Suggested Length of Time:** 2-4 days

**Standards Addressed**

*Priority:*

- 6-8-ESS1-3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]

**Detailed Description/Instructions:** See The Solar System Scope - Evaluate: The Performance Expectation Assessment Task PART 2 (See Student Journal Link to differentiate between Part 1 and Part 2). Develop a model to explain gravity in the motions within galaxies and the solar system.
Engaging Experience 1
Title: Gravitational Forces Scope - Engage: Accessing Prior Knowledge
Suggested Length of Time: 20 minutes
Standards Addressed

Priority:
- 6-8-PS2-4 Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.]

Detailed Description/Instructions: See Gravitational Forces Scope - Engage: Accessing Prior Knowledge. In this activity, students read and respond to statements about gravity and then choose the one they consider most accurate. Students are asked to justify their answer and respond to the other statements they did not select.

Bloom’s Levels: Understand
Webb’s DOK: 3

Engaging Experience 2
Title: Gravitational Forces Scope - Explore Do 2: Activity
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
- 6-8-PS2-4 Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.]

Detailed Description/Instructions: See Gravitational Forces Scope - Explore Do 2: Activity. Students use a simulator to model system interactions between gravity and the mass of objects. Students use evidence collected from the model system and scientific reasoning to construct a scientific explanation about gravitational forces.

Bloom’s Levels: Evaluate
Webb’s DOK: 4
Engaging Experience 3
Title: Weight on Other Planets Activity
Suggested Length of Time: 20-30 minutes
Standards Addressed

Priority:
- 6-8-PS2-4 Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.]

Detailed Description/Instructions: Students will calculate their weight on other planets to understand that gravity determines weight.
https://docs.google.com/a/parkhill.k12.mo.us/document/d/1NOuWDIPiQ_Nc14SmGoewntptV7Y4hgzKvSGzb21r4I/edit?usp=sharing

Bloom’s Levels: Analyze
Webb’s DOK: 2

Engaging Experience 4
Title: The Universe Scope - Explore: Do 3 Scientific Investigation Activity
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
- 6-8-PS2-4 Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.]

Supporting:
- Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

Detailed Description/Instructions: The Universe Scope - Explore: Do 3 Scientific Investigation Activity. Students investigate and research masses of various objects in the Milky Way galaxy and analyze the effect of gravity on the relationships of the objects within the galaxy.

Bloom’s Levels: Analyze
Webb’s DOK: 4
Rubric: Rubric embedded in the student version of this Scope
Engaging Experience 1  
**Title:** The Solar System Scope - Engage: Accessing Prior Knowledge  
**Suggested Length of Time:** 20-30 minutes  
**Standards Addressed**  
*Priority:*  
- 6-8-ESS1-4 Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Examples of scale properties include the sizes of an object’s layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.]

**Detailed Description/Instructions:** See The Solar System Scope - Engage: Accessing Prior Knowledge activity. Students determine the size and scale of objects in the solar system by (1) choosing the most accurate ball to represent the planet Jupiter as compared to a ping pong ball-sized Earth, and (2) forming a circle that best approximates the size of the Sun using the same scale.  
**Bloom’s Levels:** Apply  
**Webb’s DOK:** 2

Engaging Experience 2  
**Title:** Mission: Measuring Distances in Space  
**Suggested Length of Time:** 1 hour  
**Standards Addressed**  
*Priority:*  
- 6-8-ESS1-4 Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Examples of scale properties include the sizes of an object’s layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.]

**Detailed Description/Instructions:** See Mission: Measuring Distances in Space. Students will use various resources to understand the vast distances in space between celestial bodies.  
https://docs.google.com/a/parkhill.k12.mo.us/document/d/1gKlK9JAGoMXMvttmhCFIlhVC2Grj4vSllbCVEQxCtmok/edit?usp=sharing  
**Bloom’s Levels:** Analyze  
**Webb’s DOK:** 3
Engaging Scenario 2

Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

Title: Scale Solar System Model

Suggested Length of Time: 2 days

Standards Addressed

Priority:

- 6-8-ESS1-4 Analyze and interpret data to determine scale properties of objects in the solar system. [Clarification Statement: Examples of scale properties include the sizes of an object’s layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.]

Detailed Description/Instructions: See Scale Solar System Model assignment (astronomical units project)

Students will create a model of the solar system that is accurate in scale to the distance and size of celestial bodies in the solar system.

https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B6riKJ3IlJ5rVVI4ME5TWW1GMGM/vi ew?usp=sharing

Rubric: Rubric attached to instructions
Topic 5: Earth-Sun-Moon Systems

Engaging Experience 1
Title: Patterns of Motion Scope - Engage: Accessing Prior Knowledge
Suggested Length of Time: 20-30 minutes
Standards Addressed
  Priority:
  ● 6-8-ESS1-1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon.
  [Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.]
Detailed Description/Instructions: See Patterns of Motion Scope - Engage: Accessing Prior Knowledge. Students examine sketches of the shape of the moon over the period of one month and provide explanations as to why the shape of the moon appears to change shape.
Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 2
Title: Patterns of Motion Scope - Explore Do 2: Activity
Suggested Length of Time: 30-45 minutes
Standards Addressed
  Priority:
  ● 6-8-ESS1-1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon.
  [Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.]
Detailed Description/Instructions: See Patterns of Motion Scope - Explore Do 2: Activity. Students model cyclic patterns of lunar phases to identify cause and effect relationships and use the model to predict and describe lunar patterns.
Bloom’s Levels: Apply
Webb’s DOK: 3

Engaging Experience 3
Title: Patterns of Motion Scope - Explore Do 3: Engineering Solutions
Suggested Length of Time: 1-2 hours
Standards Addressed
  Priority:
  ● 6-8-ESS1-1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon.
[Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.]

**Detailed Description/Instructions:** See Patterns of Motion Scope - Explore Do 3: Engineering Solutions. Students use the engineering design process to design and create a model that describes the cyclic patterns of lunar phases.

**Bloom’s Levels:** Create  
**Webb’s DOK:** 4  
**Rubric:** Rubric embedded in student page of this Scope

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**Engaging Experience 4**  
**Title:** Oreo Moon Phases  
**Suggested Length of Time:** 15-30 minutes  
**Standards Addressed**  
**Priority:**  
- 6-8-ESS1-1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon.  
[Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.]

**Detailed Description/Instructions:** Oreo Moon Phases  
Students create a kinesthetic model of the phases of the Moon using Oreo cookies.  
https://docs.google.com/a/parkhill.k12.mo.us/document/d/1qAhLc8gIJTiQsnc1r7-gW7_z4R0ZqRUB4r-eNfe_9o/edit?usp=sharing  
**Bloom’s Levels:** Analyze  
**Webb’s DOK:** 3

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**Engaging Experience 5**  
**Title:** Earth, Sun, and Moon System Scope - Explore Do 1: Activity  
**Suggested Length of Time:** 30-45 minutes  
**Standards Addressed**  
**Priority:**  
- 6-8-ESS1-1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon.  
[Clarification Statement: Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.]

**Detailed Description/Instructions:** See Earth, Sun, and Moon System Scope - Explore Do 1: Activity. Students develop and use a kinesthetic model to predict and describe phenomena such as solar and lunar eclipses within the Earth-sun-moon system.  
**Bloom’s Levels:** Understand  
**Webb’s DOK:** 3
Engaging Experience 6
Title: Earth, Sun, and Moon System Scope - Explore Do 2: Activity
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
- 6-8-ESS1-2 Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

Detailed Description/Instructions: See Earth, Sun, and Moon System Scope - Explore Do 2: Activity. Students discover seasons as a result of changes in the number of daylight hours and the angle of incidence of the Sun’s light rays on Earth’s surface due to the tilt of Earth on its axis and Earth’s revolution around the Sun.

Bloom’s Levels: Analyze
Webb’s DOK: 3

Engaging Experience 7
Title: Earth, Sun, and Moon System Scope - Explore Do 3: Activity
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
- 6-8-ESS1-2 Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

Detailed Description/Instructions: See Earth, Sun, and Moon System Scope - Explore Do 3: Activity. Students discover seasons as a result of changes due to differential intensity of the Sun’s light rays on Earth’s surface.

Bloom’s Levels: Analyze
Webb’s DOK: 3

Engaging Experience 8
Title: Earth, Sun, and Moon System Scope - Explore Do 4: Scientific Investigation
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
- 6-8-ESS1-2 Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]
Supporting:

- ISTE - Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.

**Detailed Description/Instructions:** See Earth, Sun, and Moon System Scope - Explore Do 4: Scientific Investigation. Students investigate and compare cause and effect relationships demonstrated by patterns of daylight hours received at various latitudes during a one year time period. Students use digital tools (computer and spreadsheet program) to analyze patterns and trends found the number of daylight hours at various latitudes during different seasons.

**Bloom’s Levels:** Evaluate

**Webb’s DOK:** 3

**Rubric:** Rubric embedded into student page of this Scope
Engaging Scenario 3

Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

Title: See The Solar System Scope - Evaluate: The Performance Expectation Assessment Task: PART 1
Suggested Length of Time: 2-4 days

Standards Addressed

Priority:
- Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical or conceptual.]

Detailed Description/Instructions: See The Solar System Scope - Evaluate: The Performance Expectation Assessment Task PART 1. (See Student Journal link to differentiate between part 1 and part 2). Develop and use a model of the Earth-Sun-Moon system to describe the cyclic patterns of lunar phases, eclipses of the Sun and Moon, and seasons as experienced on Earth.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Engaging Experience Title</th>
<th>Description</th>
<th>Suggested Length of Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Solar System</td>
<td>Universe Analogies</td>
<td>Create an analogy for the arrangement of the universe.</td>
<td>15 min</td>
</tr>
<tr>
<td>The Solar System</td>
<td>Structure of the Solar System notes</td>
<td>Students will record information about the structure of the solar system.</td>
<td>1 hr</td>
</tr>
<tr>
<td>The Solar System</td>
<td>The Universe Scope--Explain: STEMScopedia</td>
<td>See The Universe Scope - Explain: STEMScopedia. Students will read information about the solar system and assess their comprehension.</td>
<td>1 hr</td>
</tr>
</tbody>
</table>
| The Role of Gravity in the Motions of Space | The Universe Scope--Engage: Accessing Prior Knowledge Activity | The Universe Scope - Accessing Prior Knowledge activity  
In this activity, students choose the statement that most accurately describes the role of gravity in the motion within galaxies.                                                                 | 15-20 min               |
Students make a model to show how objects interact in space as the result of gravity.                                                                                                                   | 1 hr                    |
| The Role of Gravity in the Motions of Space | The Solar System Scope--Explore Do 1 Activity      | See The Solar System Scope - Explore Do 1: Activity  
Students demonstrate that systems in a dynamic equilibrium are stable due to a                                                                                                                                  | 1 hr                    |
balance between inertia and gravity by modeling an object’s revolution around another. Students use the model to predict and describe events that would take place within the system if phenomena, such as gravity or inertia, changes.

<table>
<thead>
<tr>
<th>The Role of Gravity in the Motions of Space</th>
<th>Gravity Pitch</th>
<th>Gravity Pitch simulation. Observe the path of the ball when it is thrown at different velocities. Throw the ball on different planets to see how each planet's gravity affects the ball.</th>
<th>1 hr</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Effect of Mass on Gravitational Interactions</td>
<td>Gravitational Forces Scope--Engage: Accessing Prior Knowledge</td>
<td>See Gravitational Forces Scope - Engage: Accessing Prior Knowledge. In this activity, students read and respond to statements about gravity and then choose the one they consider most accurate. Students are asked to justify their answer and respond to the other statements they did not select.</td>
<td>20 min</td>
</tr>
<tr>
<td>The Effect of Mass on Gravitational Interactions</td>
<td>Gravitational Forces Scope--Explore Do 2: Activity</td>
<td>See Gravitational Forces Scope - Explore Do 2: Activity. Students use a simulator to model system interactions between gravity and the mass of objects. Students use evidence collected from the model system and scientific reasoning to construct a scientific explanation about gravitational forces.</td>
<td>1-2 hrs</td>
</tr>
<tr>
<td>The Effect of Mass on Gravitational Interactions</td>
<td>Weight on Other Planets Activity</td>
<td>Students will calculate their weight on other planets to understand that gravity determines weight.</td>
<td>20-30 min</td>
</tr>
<tr>
<td>The Effect of Mass on Gravitational Interactions</td>
<td>The Universe Scope--Explore: Do 3 Scientific</td>
<td>The Universe Scope - Explore: Do 3 Scientific Investigation Activity. Students investigate and research masses of various objects in the Milky Way galaxy and</td>
<td>1-2 hrs</td>
</tr>
<tr>
<td>Activity</td>
<td>Description</td>
<td>Time</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------</td>
<td></td>
</tr>
<tr>
<td><strong>Investigation Activity</strong></td>
<td>analyze the effect of gravity on the relationships of the objects within the galaxy.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scale Properties of Objects in the Solar System</td>
<td>The Solar System Scope -- Engage: Accessing Prior Knowledge See The Solar System Scope - Engage: Accessing Prior Knowledge activity. Students determine the size and scale of objects in the solar system by (1) choosing the most accurate ball to represent the planet Jupiter as compared to a ping pong ball-sized Earth, and (2) forming a circle that best approximates the size of the Sun using the same scale.</td>
<td>20-30 min</td>
<td></td>
</tr>
<tr>
<td>Scale Properties of Objects in the Solar System</td>
<td>Mission: Measuring Distances in Space See Mission: Measuring Distances in Space Students will use various resources to understand the vast distances in space between celestial bodies.</td>
<td>1 hr</td>
<td></td>
</tr>
<tr>
<td>Earth-Sun-Moon Systems</td>
<td>Patterns of Motion Scope -- Engage: Accessing Prior Knowledge See Patterns of Motion Scope - Engage: Accessing Prior Knowledge. Students examine sketches of the shape of the moon over the period of one month and provide explanations as to why the shape of the moon appears to change shape.</td>
<td>20-30 min</td>
<td></td>
</tr>
<tr>
<td>Earth-Sun-Moon Systems</td>
<td>Patterns of Motion Scope -- Explore Do 2: Activity See Patterns of Motion Scope - Explore Do 2: Activity. Students model cyclic patterns of lunar phases to identify cause and effect relationships and use the model to predict and describe lunar patterns.</td>
<td>30-45 min</td>
<td></td>
</tr>
<tr>
<td>Earth-Sun-Moon Systems</td>
<td>Patterns of Motion Scope -- Explore Do 3: Engineering Solutions See Patterns of Motion Scope - Explore Do 3: Engineering Solutions. Students use the engineering design process to design and create a model that describes the cyclic patterns of lunar phases.</td>
<td>1-2 hrs</td>
<td></td>
</tr>
<tr>
<td>Earth-Sun-Moon Systems</td>
<td>Oreo Moon Phases</td>
<td>Oreo Moon Phases</td>
<td>15-30 min</td>
</tr>
<tr>
<td>------------------------</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Students create a kinesthetic model of the phases of the Moon using Oreo cookies.</td>
<td></td>
</tr>
<tr>
<td>Earth-Sun-Moon Systems</td>
<td>Earth, Sun, and Moon Systems Scope--Explore Do 1: Activity</td>
<td>See Earth, Sun, and Moon System Scope - Explore Do 1: Activity. Students develop and use a kinesthetic model to predict and describe phenomena such as solar and lunar eclipses within the Earth-sun-moon system.</td>
<td>30-45 min</td>
</tr>
<tr>
<td>Earth-Sun-Moon Systems</td>
<td>Earth, Sun, and Moon Systems Scope--Explore Do 2: Activity</td>
<td>See Earth, Sun, and Moon System Scope - Explore Do 2: Activity. Students discover seasons as a result of changes in the number of daylight hours and the angle of incidence of the Sun’s light rays on Earth’s surface due to the tilt of Earth on its axis and Earth’s revolution around the Sun.</td>
<td>1-2 hrs</td>
</tr>
<tr>
<td>Earth-Sun-Moon Systems</td>
<td>Earth, Sun, and Moon System Scope--Explore Do 3: Activity</td>
<td>See Earth, Sun, and Moon System Scope - Explore Do 3: Activity. Students discover seasons as a result of changes due to differential intensity of the Sun’s light rays on Earth’s surface.</td>
<td>1-2 hrs</td>
</tr>
<tr>
<td>Earth-Sun-Moon Systems</td>
<td>Earth, Sun, and Moon System Scope--Explore Do 4: Scientific Investigation</td>
<td>See Earth, Sun, and Moon System Scope - Explore Do 4: Scientific Investigation. Students investigate and compare cause and effect relationships demonstrated by patterns of daylight hours received at various latitudes during a one-year time period. Students use digital tools (computer and spreadsheet program) to analyze patterns and trends found the number of daylight hours at various latitudes during different seasons.</td>
<td>1-2 hrs</td>
</tr>
</tbody>
</table>
Unit 3: Weather

Subject: Science
Grade: 7
Name of Unit: Weather
Length of Unit: 50-55 days
Overview of Unit: This unit focuses on the flow of energy and water throughout Earth’s hydrosphere. Students will model the water cycle and atmospheric and oceanic circulations plus research and demonstrate the interactions of air masses resulting in weather changes and the long term causes and effects of global temperature changes.

Priority Standards for unit:

- 6-8-ESS2-4 Design and develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.]

- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

- 6-8-ESS2-5 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

- 6-8-ESS3-5 Analyze evidence of the factors that have caused the change in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities.]
Supporting Standards for unit:
- ASD #9-Students will respond to diversity by building empathy, respect, understanding, and connection

<table>
<thead>
<tr>
<th>Unwrapped Concepts (Students need to know)</th>
<th>Unwrapped Skills (Students need to be able to do)</th>
<th>Bloom’s Taxonomy Levels</th>
<th>Webb's DOK</th>
</tr>
</thead>
<tbody>
<tr>
<td>The cycling of water through Earth's systems driven by energy from the sun and the force of gravity.</td>
<td>Design</td>
<td>Create</td>
<td>1</td>
</tr>
<tr>
<td>The cycling of water through Earth's systems driven by energy from the sun and the force of gravity.</td>
<td>Develop</td>
<td>Create</td>
<td>3</td>
</tr>
<tr>
<td>Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.</td>
<td>Develop</td>
<td>Create</td>
<td>3</td>
</tr>
<tr>
<td>Unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.</td>
<td>Use</td>
<td>Understand</td>
<td>2</td>
</tr>
<tr>
<td>The motions and complex interactions of air masses results in changes in weather conditions.</td>
<td>Research</td>
<td>Apply</td>
<td>2</td>
</tr>
<tr>
<td>The motions and complex interactions of air masses results in changes in weather conditions.</td>
<td>Collect</td>
<td>Apply</td>
<td>2</td>
</tr>
<tr>
<td>The motions and complex interactions of air masses results in changes in weather conditions.</td>
<td>Analyze</td>
<td>Analyze</td>
<td>3</td>
</tr>
<tr>
<td>The change in global temperatures over the past century.</td>
<td>Analyze</td>
<td>Analyze</td>
<td>3</td>
</tr>
</tbody>
</table>

**Essential Questions:**
1. How does water move from one area to another?
2. How do meteorologists predict weather?
3. Why would the temperatures on the same latitude be different in different parts of the world?
4. Why is there a Coriolis Effect?
5. How has global warming affected sea levels?

**Enduring Understanding/Big Ideas:**
1. Meteorologists research, collect, and analyze data to provide evidence for the interaction of air masses.
2. The cycling of water through Earth’s systems is driven by energy from the sun and the force of gravity.
3. The unequal heating and rotation of the Earth cause atmospheric and ocean circulation that determine regional climates.
4. Human activities and natural processes have affected global temperatures over the past century.
5. Human activities and natural processes have affected sea levels over the past century.

**Unit Vocabulary:**

<table>
<thead>
<tr>
<th>Academic Cross-Curricular Words</th>
<th>Content/Domain Specific</th>
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<tbody>
<tr>
<td>Visualizations</td>
<td>Rotation</td>
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<td></td>
<td>Oceanic circulation</td>
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<td>Regional climates</td>
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<td>Coriolis effect</td>
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<td>Air masses</td>
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<td>Precipitation</td>
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<td></td>
<td>Global temperatures</td>
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<td></td>
<td>Fossil fuels</td>
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<td></td>
<td>Combustion</td>
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<tr>
<td></td>
<td>Hydrologic cycle</td>
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<tr>
<td></td>
<td>Gravity</td>
</tr>
</tbody>
</table>

**Resources for Vocabulary Development:**
Human Activities and Global Climate Change Scope
Water on Earth Scope
Influences on Weather and Climate Scope
Oceans Influence on Weather and Climate Scope
Water in the Atmosphere Scope
Predicting Weather Scope
The Water Cycle Scope
Topic 1: Water Cycle

Engaging Experience 1
Title: The Water Cycle Scope - Engage: Accessing Prior Knowledge
Suggested Length of Time: 20-30 minutes
Standards Addressed

Priority:
- 6-8-ESS2-4 Design and develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
  [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.]

Detailed Description/Instructions: See The Water Cycle Scope - Engage: Accessing Prior Knowledge
- Students illustrate a water cycle. The illustration will include labels and temperatures. Students use their illustrations to answer probing questions.

Bloom’s Levels: Remember
Webb’s DOK: 1

Engaging Experience 2
Title: The Water Cycle Scope - Engage: Hook
Suggested Length of Time: 30-45 minutes
Standards Addressed

Priority:
- 6-8-ESS2-4 Design and develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
  [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.]

- Students match icons to vocabulary words and definitions using a graphic organizer.

Bloom’s Levels: Remember
Webb’s DOK: 1

Engaging Experience 3
Title: Journey Through the Water Cycle
Suggested Length of Time: 1 hour
Standards Addressed
Priority:

- 6-8-ESS2-4 Design and develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
  [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.]

Detailed Description/Instructions: See the Journey Through the Water Cycle activity.

- Students will take a journey through the water cycle as a drop of water.
  
  https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B6riKJ3lIJJ5rUHNBRFBQUmpJdF
  U/view?usp=sharing
  https://docs.google.com/a/parkhill.k12.mo.us/document/d/1nq2WzxGSQZfsoZ1raEnN3
  QXb-Akz_u7wT1cyS9hyfI/edit?usp=sharing

Bloom’s Levels: Apply

Webb’s DOK: 2
Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

See the Water Cycle Scope - Explore: Do 3 Engineering Solutions. Students use the engineering design process to develop models of a natural system, such as the water cycle, that includes descriptors for the transfer of energy that drives motion and cycling of matter within the system.
Student models describe unobservable mechanisms in the system, such as global movements of water via transpiration, evaporation, condensation, and crystallization.
Engaging Experience 1
Title: Atmosphere Notes
Suggested Length of Time: 30-45 minutes
Standards Addressed

Priority:
- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

Detailed Description/Instructions: See “Earth’s Atmosphere” PowerPoint (link below)
- Students will take notes on the makeup of our atmosphere and get an introduction to the layers of the atmosphere.

https://drive.google.com/open?id=0B1cSc1ufGRBYREs2dmlIcGh0X3M

Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 2
Title: Layers of the Atmosphere
Suggested Length of Time: 1-2 days
Standards Addressed

Priority:
- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

Detailed Description/Instructions: See Layers of the Atmosphere activity.
Students will identify and describe the layers of the atmosphere.

Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 3
Title: Temperature Layers of the Atmosphere Graph
Suggested Length of Time: 30-45 minutes
Standards Addressed

Priority:
- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

Detailed Description/Instructions: See Temperature Layers of the Atmosphere Graph
- Students will graph the temperature ranges for each layer of the atmosphere to identify a pattern and create an explanation for the heating of the layers of the atmosphere.

Bloom’s Levels: Analyze
Webb’s DOK: 3

Engaging Experience 4
Title: Influences on Weather and Climate Scope - Explore: Do 2 activity
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how
patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.

**Detailed Description/Instructions:** See Influences on Weather and Climate Scope - Explore: Do 2 activity

- Students compare maps of the global winds and global ocean surface currents to identify patterns.

**Bloom’s Levels:** Understand

**Webb’s DOK:** 2

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**Engaging Experience 5**

**Title:** The Windy Pirate Activity

**Suggested Length of Time:** 1 hour

**Standards Addressed**

**Priority:**

- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

**Detailed Description/Instructions:** See Windy Pirate activity:

[https://docs.google.com/a/parkhill.k12.mo.us/presentation/d/1_s05nNJISlQHASIY2NGO6EIxIQtKNq8MkbA_t5uMknE/edit?usp=sharing](https://docs.google.com/a/parkhill.k12.mo.us/presentation/d/1_s05nNJISlQHASIY2NGO6EIxIQtKNq8MkbA_t5uMknE/edit?usp=sharing)

[https://docs.google.com/a/parkhill.k12.mo.us/document/d/1A-shvBJYOFJKqe00kxCtr7KZlgnXMLxTEVzdwf-_apw/edit?usp=sharing](https://docs.google.com/a/parkhill.k12.mo.us/document/d/1A-shvBJYOFJKqe00kxCtr7KZlgnXMLxTEVzdwf-_apw/edit?usp=sharing)

- Students are a pirate crew preparing to set sail to plunder and pillage a far-off village. They must apply their knowledge of atmospheric circulation, the Coriolis effect, and wind currents to successfully manage each scenario.

**Bloom’s Levels:** Apply

**Webb’s DOK:** 3
Engaging Experience 6
Title: Water on Earth Scope - Engage: Hook
Suggested Length of Time: 30-45 minutes
Standards Addressed
  Priority:
  ● 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

Detailed Description/Instructions: See Water on Earth Scope - Engage: Hook.
  ● Students observe that cold water sinks in warm water as an introduction to the convection currents that drive the deep ocean currents.

Bloom’s Levels: Understand
Webb’s DOK: 3

Engaging Experience 7
Title: Water on Earth Scope - Explore: Do 1 activity
Suggested Length of Time: 1-2 hours
Standards Addressed
  Priority:
  ● 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

Detailed Description/Instructions: See Water on Earth Scope - Explore: Do 1 activity
  ● Students determine and compare the density of cold salt water to warm tap water. Students use a digital balance and a pan balance to collect data and then consider limitations of data analysis such as measurement errors and methodology.

Bloom’s Levels: Apply
Webb’s DOK: 1
**Engaging Experience 8**

**Title:** Water on Earth Scope - Explore: Do 1 activity

**Suggested Length of Time:** 1-2 hours

**Standards Addressed**

*Priority:*

- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

**Detailed Description/Instructions:** See Water on Earth Scope - Explore: Do 1 activity

- Students determine and compare the density of cold salt water to warm tap water. Students use a digital balance and a pan balance to collect data and then consider limitations of data analysis such as measurement errors and methodology.

**Bloom’s Levels:** Apply

**Webb’s DOK:** 1

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**Engaging Experience 9**

**Title:** Influences on Weather and Climate - Explore Do 4: Scientific Investigation

**Suggested Length of Time:** 1-2 hours

**Standards Addressed**

*Priority:*

- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]

**Detailed Description/Instructions:** See Influences on Weather and Climate - Explore Do 4: Scientific Investigation.

- Students compare the average climate data of two land masses to determine the effect of ocean currents on climate.

**Bloom’s Levels:** Analyze
Engaging Experience 10
Title: Water in the Atmosphere Scope Explore Do 2 Activity
Suggested Length of Time: 30-45 minutes
Standards Addressed

Priority:
- 6-8-ESS2-5 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

Detailed Description/Instructions: See Water in the Atmosphere Scope Explore Do 2 Activity
- Students discover how proximity to and the temperature of ocean currents affect the amount of moisture in the atmosphere and the weather in an area. Students collect data from maps to produce data that them to make these determinations.

Bloom’s Levels: Analyze
Webb’s DOK: 3

Engaging Experience 11
Title: Oceans and Weather Stemscope Elaborate Math Connection A
Suggested Length of Time: 1-2 hours
Standards Addressed:

Priority:
- 6-8-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.]
**Detailed Description/Instructions:** See Oceans and Weather Stemscope - Elaborate Math

**Bloom’s Level:** Apply and Analyze

**DOK:** 2
Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

See the Influences on Weather and Climate Scope - Evaluate; Performance Expectation Assessment Task.

- A simple model or models will help the students understand the causes of patterns in atmospheric and oceanic circulation.
Engaging Experience 1

Title: Water in the Atmosphere Scope - Engage: Hook

Suggested Length of Time: 1 hour

Standards Addressed

Priority:

- 6-8-ESS2-5 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

Detailed Description/Instructions: See Water in the Atmosphere Scope Engage Hook.

- Students use a Venn diagram to differentiate between weather and climate.

Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 2

Title: Predicting Weather Scope - Engage: Accessing Prior Knowledge

Suggested Length of Time: 15-20 minutes

Standards Addressed

Priority:

- 6-8-ESS2-5 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

Detailed Description/Instructions: See Predicting Weather Scope - Engage: Accessing Prior Knowledge.
● Students evaluate weather predictions from four different meteorologists and determine which prediction is the most believable.

Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 3
Title: Water in the Atmosphere Scope Explore Do 1 Activity
Suggested Length of Time: 30-45 minutes
Standards Addressed

Priority:
● 6-8-ESS2-5 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

Detailed Description/Instructions: See Water in the Atmosphere Scope Explore Do 1 Activity
● Students use maps and yearly rainfall data to evaluate weather conditions and determine the location of rain shadows, the use cause and effect relationships to predict weather patterns in other locations.

Bloom’s Levels: Evaluate
Webb’s DOK: 3

Engaging Experience 4
Title: Water in The Atmosphere Explore Do 3 Activity
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
● 6-8-ESS2-5 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps,
diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

**Detailed Description/Instructions:** See Water in the Atmosphere Explore Do 3 Activity
- Students observe the relationship between wind and air pressure.

**Bloom’s Levels:** Understand

**Webb’s DOK:** 2

### Engaging Experience 5
**Title:** Using a Weather Map
**Suggested Length of Time:** 2 days

**Standards Addressed**

**Priority:**
- 6-8-ESS2-5 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

**Detailed Description/Instructions:** Part 1: Use teacher PowerPoint “Weather Conditions and Forecasting” along with paper copies of maps/questions of the U.S to identify weather patterns and predict future conditions. Part 2: Students use directions to create their own weather map showing specific current/predictions

- PowerPoint:
  https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B1cSc1ufGRBYYhXTFqDa0ZmYzg/view?usp=sharing
- Weather map with questions:
  https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B1cSc1ufGRBYYaERpbE9LMWRRcVk/view?usp=sharing
- Questions for Weather map:
  https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B1cSc1ufGRBYYbTlOTZtbojNYU/view?usp=sharing
- Blank Weather Map:
  https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B1cSc1ufGRBYYVnA5WXJabnkyRdEE/view?usp=sharing

**Bloom’s Levels:** Apply

**Webb’s DOK:** 3
Engaging Experience 6
Title: Predicting Weather Scope - Explore Do 3: Activity
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:

● 6-8-ESS2-5 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within possible ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).]

Detailed Description/Instructions: See Predicting Weather Scope - Explore Do 3: Activity.

● Students track the path and intensity of a hurricane and issue weather alerts based on their predicted path of the storm.

● Students apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize wind speed data.

Bloom’s Levels: Apply
Webb’s DOK: 4
Engaging Scenario

**Engaging Scenario** (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

See Water in the Atmosphere Scope - See Water in the Atmosphere Scope - Explore Do 4: PBL

- This Project Based Learning Challenge is to solve the challenge of using atmospheric factors, such as water vapor, air pressure, and temperature to better predict when storms will occur. The students will provide information about how data samples can be used to predict the emergence of a storm.

Engaging Scenario

**Engaging Scenario** (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

See Predicting Weather Scope - Explore Do 4: PBL.

- This Project Based Learning Challenge is to solve the problem of helping a store decide when inventory should be moved and what inventory should be moved to the locations with the most need based on predicted weather patterns. Because these patterns are so complex, weather can only be predicted probabilistically. The students will use the engineering design process to generate a plan that will allow a store to know, based on weather predictions, when to move inventory to other stores with the greatest need to increase sales for the company. Knowledge of predicted weather patterns for a 3-5-day period in conjunction with climate data for a student-chosen location will be required. An inventory list of desirable products that consumers use for probable weather conditions at that location will also be necessary.
Topic 4: Change in Global Temperatures

Engaging Experience 1
Title: Human Activities and Global Climate Change Explore Do 1 Activity
Suggested Length of Time: 20-35 minutes
Standards Addressed

Priority:
- 6-8-ESS3-5 Analyze evidence of the factors that have caused the change in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities.]

Detailed Description/Instructions: Students create a list of questions and comments about global climate.
Bloom’s Levels: Remember
Webb’s DOK: 1

Engaging Experience 2
Title: Changing Global Temperatures Graph
Suggested Length of Time: 30-45 minutes
Standards Addressed

Priority:
- 6-8-ESS3-5 Analyze evidence of the factors that have caused the change in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities.]

Detailed Description/Instructions: See Changing Global Temperatures Graph
https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B6riKJ3lIJJ5ra3JZanB2TttTWc/view?usp=sharing
https://docs.google.com/a/parkhill.k12.mo.us/presentation/d/1p8w26oxOxoweFTvuhUuifr2Mivpk5rUaw4kLLqEFBmE/edit?usp=sharing
- Students will graph carbon dioxide levels and temperature over time to determine if there is a relationship between carbon dioxide levels in the atmosphere and the Earth’s surface temperature.
Bloom’s Levels: Analyze; Webb’s DOK: 3
Engaging Experience 3
Title: Human Activities and Global Climate Change Scope - Explore Do 2: Research
Suggested Length of Time: 2-3 hours

Standards Addressed
Priority:

- 6-8-ESS3-5 Analyze evidence of the factors that have caused the change in global temperatures over the past century. [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities.]

Detailed Description/Instructions: See Human Activities and Global Climate Change Scope - Explore Do 2: Research.

- Students research information about global climate change based on sudden events and gradual changes that accumulate over time by focusing on a selected question developed in Do Task 1.
- Students think critically by asking questions to identify or clarify evidence and/or the premise of an argument as they search for answers to their selected question.
- Emphasis: Find examples from fossil fuels, combustion, and agriculture as well as natural processes such as solar radiation or volcanic activity.
- Suggested resources:
  - Human Activities and Global Climate Change Scope - Explain: STEMScopedia
  - Human Activities and Global Climate Change Scope - Elaborate: Reading Science A, B, or C
  - Human Activities and Global Climate Change Scope - Elaborate: Science Today - Read It!
  - Human Activities and Global Climate Change Scope - Acceleration: Web Surfing Science
  - Temperature Changes Since 1880 article
  - NASA, NOAA Data Show 2016 Warmest Year on Record Globally article

Bloom’s Levels: Analyze
Webb’s DOK: 3
Engaging Scenario

(An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

See Human Activities and Global Climate Change Scope - Explore Do 3: PBL
This Project Based Learning Challenge is to create a product to raise the level of awareness for possible solutions that reduce one or more major factors contributing to climate change. Students create a product that communicates their understanding of how human activities contribute to global climate change.
<table>
<thead>
<tr>
<th>Topic</th>
<th>Engaging Experience Title</th>
<th>Description</th>
<th>Suggested Length of Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Cycle</td>
<td>Journey Through the Water Cycle</td>
<td>Students will take a journey through the water cycle as a drop of water.</td>
<td>1 hour</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>Atmosphere Notes</td>
<td>Students will engage in taking notes on the makeup of our atmosphere and get an introduction to the layers of the atmosphere.</td>
<td>30-45 min</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>Layers of the Atmosphere</td>
<td>See Layers of Atmosphere activity on Google Drive</td>
<td>1-2 days</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>Temperature Layers of the Atmosphere Graph</td>
<td>Students will graph the temperature ranges for each layer of the atmosphere to identify a pattern and create an explanation for the heating of the layers of the atmosphere.</td>
<td>30-45 min</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Weather and Climate Scope-</td>
<td>Influences on Weather and Climate Scope-</td>
<td>Students compare maps of the global winds and global ocean surface currents to identify patterns</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>Atmosphere &amp; Ocean</td>
<td>Explore: Do 2 Activity</td>
<td>Description</td>
<td>Duration</td>
</tr>
<tr>
<td>--------------------</td>
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</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>The Windy Pirate Activity</td>
<td>Students are a pirate crew preparing to set sail to plunder and pillage a far-off village. They must apply their knowledge of atmospheric circulation, the Coriolis effect, and wind currents to successfully manage each scenario.</td>
<td>1 hour</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>Water on Earth Scope-Engage: Hook</td>
<td>Students observe that cold water sinks in warm water as an introduction to the convection currents that drive the deep ocean currents.</td>
<td>30-45 min</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>Water on Earth Scope-Explore: Do 1 Activity</td>
<td>Students determine and compare the density of cold salt water to warm tap water. Students use a digital balance and a pan balance to collect data and then consider limitations of data analysis such as measurement errors and methodology.</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>Water on Earth Scope-Explore: Do 1 Activity</td>
<td>Students determine and compare the density of cold salt water to warm tap water. Students use a digital balance and a pan balance to collect data and then consider limitations of data analysis such as measurement errors and methodology.</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>Influences on Weather and Climate-Explore Do 4: Scientific Investigation</td>
<td>Students compare the average climate data of two land masses to determine the effect of ocean currents on climate.</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>The Effect of Heat Transfer on the Atmosphere &amp; Ocean</td>
<td>Water in the Atmosphere Scope-Explore Do 2 Activity</td>
<td>Students discover how proximity to and the temperature of ocean currents affect the amount of moisture in the atmosphere and the weather in an area. Students collect data from maps to</td>
<td>30-45 min</td>
</tr>
<tr>
<td>Weather</td>
<td>Water in the Atmosphere Scope-Engage: Hook</td>
<td>Students use a Venn diagram to differentiate between weather and climate.</td>
<td>1 hour</td>
</tr>
<tr>
<td>Weather</td>
<td>Predicting Weather Scope-Engage: Accessing Prior Knowledge</td>
<td>Students evaluate weather predictions from four different meteorologists and determine which prediction is the most believable.</td>
<td>15-20 min</td>
</tr>
<tr>
<td>Weather</td>
<td>Water in the Atmosphere Scope-Explore Do 1: Activity</td>
<td>Students use maps and yearly rainfall data to evaluate weather conditions and determine the location of rain shadows, the use cause and effect relationships to predict weather patterns in other locations.</td>
<td>30-45 min</td>
</tr>
<tr>
<td>Weather</td>
<td>Water in the Atmosphere Scope-Explore Do 3: Activity</td>
<td>Students observe the relationship between wind and air pressure.</td>
<td>1-2 hours</td>
</tr>
</tbody>
</table>
| Weather | Using a Weather Map | ● Part 1: Use teacher PowerPoint “Weather Conditions and Forecasting” along with paper copies of maps/questions of the U.S to identify weather patterns and predict future conditions.  
  ● Part 2: Students use directions to create their own weather map showing specific current/predictions | 2 days |
| Weather | Predicting Weather Scope-Explore Do 3: Activity | ● Students track the path and intensity of a hurricane and issue weather alerts based on their predicted path of the storm.  
● Students apply concepts of statistics and probability (including mean, median, mode, and variability) to analyze and characterize wind speed data. | 1-2 hours |
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</thead>
<tbody>
<tr>
<td>Change in Global Temperatures</td>
<td>Human Activities and Global Climate Change-Explore Do 1: Activity</td>
<td>Students create a list of questions and comments about global climate.</td>
<td>20-35 min</td>
</tr>
<tr>
<td>Change in Global Temperatures</td>
<td>Changing Global Temperatures Graph</td>
<td>Students will graph carbon dioxide levels and temperature over time to determine if there is a relationship between carbon dioxide levels in the atmosphere and the Earth’s surface temperature.</td>
<td>30-45 min</td>
</tr>
<tr>
<td>Change in Global Temperatures</td>
<td>Human Activities and Global Climate Change Scope-Explore Do 2: Research</td>
<td>Students research information about global climate as change based sudden events and gradual changes that accumulate over time by focusing on a selected question developed in Do Task 1.</td>
<td>2-3 hours</td>
</tr>
</tbody>
</table>
Unit 4: Heredity

Subject: Science
Grade: 7
Name of Unit: Heredity
Length of Unit: 46-50 days

Overview of Unit: This unit focuses on the survival of individuals and species of plants and animals due to environmental and genetic factors, including natural selection and human technologies.

Priority Standards for unit:

● 6-8-LS1-6 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]

● 6-8-LS1-5 Construct an explanation for how characteristic animal behaviors as well as specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of animal behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds; and, creating conditions for seed germination and growth. Examples of plant structures that affect the probability of plant reproduction could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

● 6-8-LS4-2 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

● 6-8-LS4-3 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, and farming practices).]

● 6-8-LS4-4 Interpret graphical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
Supporting Standards for unit:

- 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- ASD #9- Students will respond to diversity by building empathy, respect, understanding, and connection

<table>
<thead>
<tr>
<th>Unwrapped Concepts (Students need to know)</th>
<th>Unwrapped Skills (Students need to be able to do)</th>
<th>Bloom's Taxonomy Levels</th>
<th>Webb's DOK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental and genetic factors influence the growth of organisms.</td>
<td>Construct</td>
<td>Understand</td>
<td>3</td>
</tr>
<tr>
<td>Characteristic animal behaviors as well as specialized plant structures affect the probability of successful reproduction of animals and plants respectively.</td>
<td>Construct</td>
<td>Understand</td>
<td>3</td>
</tr>
<tr>
<td>Genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.</td>
<td>Construct</td>
<td>Understand</td>
<td>3</td>
</tr>
<tr>
<td>Technologies that have changed the way humans influence the inheritance of desired traits in organisms.</td>
<td>Gather</td>
<td>Understand</td>
<td>2</td>
</tr>
<tr>
<td>Technologies that have changed the way humans influence the inheritance of desired traits in organisms.</td>
<td>Synthesize</td>
<td>Create</td>
<td>3 (one source) 4 (multiple sources)</td>
</tr>
<tr>
<td>Natural selection may lead to increases and decreases of specific traits in populations over time.</td>
<td>Interpret</td>
<td>Analyze</td>
<td>3</td>
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</tbody>
</table>

**Essential Questions:**

1. How do environmental and genetic factors influence the growth of organisms?
2. How do animal and plant behaviors and structures affect reproduction?
3. How do genetic variations increase the probability of survival?
4. How does technology influence inheritance of traits?
5. How does natural selection lead to the increase or decrease of specific traits?

**Enduring Understanding/Big Ideas:**

1. The availability of food, space, light, and water as well as human influence affects the growth of organisms.
2. Herding from predators, vocalizations, breeding, and seed germination are examples of behaviors that affect reproduction. Colorful plumage and bright flowers are examples of structures that affect reproduction.

3. The proportion of individual organisms that have genetic variations and traits that are advantageous in a particular environment will increase from generation to generation due to natural selection because the probability that those individuals will survive and reproduce is greater.

4. The uses of artificial selection such as genetic modification, animal husbandry, and farming practices have influenced the inheritance of desired traits.

5. The process of natural selection allows favorable traits become more common and less favorable traits become less common in following generations.

**Unit Vocabulary:**

<table>
<thead>
<tr>
<th>Academic Cross-Curricular Words</th>
<th>Content/Domain Specific</th>
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<tbody>
<tr>
<td>Specific environment</td>
<td>Heredity</td>
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<td>Probability</td>
<td>Inheritance</td>
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<td>Population</td>
<td>Genetic variation</td>
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<td>Vocalization</td>
<td>Reproduction</td>
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<td></td>
<td>Natural selection</td>
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<td></td>
<td>Trait</td>
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<td>Organism</td>
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<td>Genetic outcome</td>
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<td></td>
<td>Artificial selection</td>
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<td></td>
<td>Genetic modification</td>
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<tr>
<td></td>
<td>Animal husbandry</td>
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<td></td>
<td>Herding</td>
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<td></td>
<td>Breeding</td>
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<td></td>
<td>Seed germination</td>
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<td></td>
<td>Genetic factors</td>
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<td></td>
<td>Fertilizer</td>
</tr>
</tbody>
</table>

**Resources for Vocabulary Development:**

- Natural Selections and Populations Scope
- Evolutionary History and Relationships Scope
- Growth of Plants Scope
- Embryonic Development Scope
- Introduction to Photosynthesis Scope
Engaging Experience 1
Title: Growth of Plants Scope - Engage: Accessing Prior Knowledge
Suggested Length of Time: 30 minutes
Standards Addressed

Priority:
- 6-8-LS1-6 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
[Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]

Supporting:
- 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

- Students read three statements on the subject of growth in organisms and write a short explanation of what they consider correct and/or incorrect in each.

Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 2
Title: Growth of Plants Scope - Engage: Hook
Suggested Length of Time: 30-45 minutes
Standards Addressed

Priority:
- 6-8-LS1-6 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
[Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]
different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]

Supporting:

- 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Detailed Description/Instructions: See Growth of Plants Scope - Engage: Hook
- Students brainstorm about plant adaptations and environmental conditions.

Bloom’s Levels: Understand
Webb’s DOK: 3

**Engaging Experience 3**

Title: Effect of Environment on New Life Form

Suggested Length of Time: 1-2 hours

Standards Addressed

Priority:
- 6-8-LS1-6 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
  [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]

Supporting:

- 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Detailed Description/Instructions: Effect of Environment on New Life Form.
- Students use the scientific method to control the environmental conditions for a fictional alien organism in order to learn how the organism responds to changes in conditions. Sunlight, water, and temperature can be varied to determine their effects on the shape of the aliens.

Bloom’s Levels: Understand
Webb’s DOK: 3
Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

See Introduction to Photosynthesis Do 3 Engineering Solutions. Students create their own terrarium. Possible Extension: See Introduction to Photosynthesis Explore Do 4 PBL. Students design greenhouse on the Moon. This expands the original activity by including human survival as part of the requirements.
Title: Reproduction in Plants and Animals Scope - Engage Accessing Prior Knowledge

Suggested Length of Time: 15-20 minutes

Standards Addressed

Priority:

● 6-8-LS1-5 Construct an explanation for how characteristic animal behaviors as well as specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of animal behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds; and, creating conditions for seed germination and growth. Examples of plant structures that affect the probability of plant reproduction could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

Supporting:

● 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Detailed Description/Instructions: See Reproduction in Plants and Animals Scope Engage Accessing Prior Knowledge

Bloom’s Levels: Understand

Webb’s DOK: 2

Engaging Experience 2

Title: Reproduction in Plants and Animals - Explore Do 1 Activity

Suggested Length of Time: 1-2 hours

Standards Addressed

Priority:

● Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.]

Supporting:

● 6-8-ETS-3 Analyze data from tests to determine similarities and differences
among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

**Detailed Description/Instructions:** See Reproduction in Plants and Animals Explore Do 1 Activity. Students observe various adaptations plants and animals have developed to help their species survive.

**Bloom’s Levels:** Understand

**Webb’s DOK:** 3

**Rubric:** Rubric embedded in Student version of Scope

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**Engaging Experience 3**

**Title:** Reproduction in Plants and Animals - Explore Do 4 Engineering Solutions

**Suggested Length of Time:** 1-2 hours

**Standards Addressed**

**Priority:**

- 6-8-LS1-5 Construct an explanation for how characteristic animal behaviors as well as specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of animal behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds; and, creating conditions for seed germination and growth. Examples of plant structures that affect the probability of plant reproduction could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

**Supporting:**

- 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

**Detailed Description/Instructions:** See Reproduction in Plants and Animals - Explore Do 4 Engineering Solutions. Students design a flower to attract a chosen type of pollinator.

**Bloom’s Levels:** Create

**Webb’s DOK:** 4

**Rubric:** Embedded into the student version of this scope

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**Topic 3: Genetic Variation - Inheritance of Traits**

**Engaging Experience 1**

**Title:** Evolutionary History and Relationships Scope - Engage Hook

**Suggested Length of Time:** 30 minutes
Standards Addressed

Priority:
- 6-8-LS4-2 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

Supporting:
- 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Detailed Description/Instructions: See Evolutionary History - Engage Hook. Students compare limbs of five different animals and discuss the differences and how those differences make that animal successful in its environment.

Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 2
Title: Natural Selection and Populations Scope - Engage: Hook
Suggested Length of Time: 15-30 minutes
Standards Addressed

Priority:
- 6-8-LS4-2 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

Supporting:
- 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.


Bloom’s Levels: Understand
Webb’s DOK: 3

Engaging Experience 3
Title: Natural Selection and Populations Scope - Explore: Do 2
Suggested Length of Time: 1-2 hours

Standards Addressed

Priority:
● 6-8-LS4-2 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

Supporting:
● 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Detailed Description/Instructions: See Natural Selection and Populations Scope - Explore: Do 2. Students match physical or behavioral traits to how the trait provides a survival advantage.

Bloom’s Levels: Understand
Webb’s DOK: 3

Engaging Experience 4
Title: Evolutionary History and Relationships - Explore Do 2
Suggested Length of Time: 30-60 minutes
Standards Addressed

Priority:
● 6-8-LS4-2 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

Supporting:
● 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Detailed Description/Instructions: See Evolutionary History and Relationships - Explore Do 2. Students will compare and contrast skeletal structures of ancestral lines of horses and dogs to identify cause and effect relationships, and to infer evolutionary relationships between modern and ancestral organisms.

Bloom’s Levels: Evaluate
Webb’s DOK: 4

Engaging Experience 5
Title: Build-a-Bird Activity
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
6-8-LS4-2 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

Supporting:

6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Detailed Description/Instructions: See Build-a-Bird Activity. https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B6riKJ3lJ5rSTRiWTJtVGHUmQzQ/view?usp=sharing

Students will investigate how various bird beaks and feet are designed for specific habitats by building their own bird.

Bloom’s Levels: Evaluate

Webb’s DOK: 4
Topic 4: Natural Selection

Engaging Experience 1
Title: Natural Selection
Suggested Length of Time: 1-2 hours
Standards Addressed

Priority:
- 6-8-LS4-4 Interpret graphical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Supporting:
- 6-8-ETS-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Detailed Description/Instructions: Students are a bird hunting moths (both dark and light) that live on trees. As you capture the moths most easily visible against the tree surface, the moth populations change, illustrating the effects of natural selection.

Bloom’s Levels: Analyze
Webb’s DOK: 3

Engaging Experience 2
Title: Natural Selection Work
Suggested Length of Time: 1 hour
Standards Addressed

Priority:
- 6-8-LS4-4 Interpret graphical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Detailed Description/Instructions: See link to learning within the concepts of natural selection and adaptation.
https://drive.google.com/a/parkhill.k12.mo.us/file/d/0B1cSc1ufGRBYOFBsams4eWtNTGs/view?usp=sharing

Bloom’s Levels: Apply
Webb’s DOK: 2

Topic 5: Human Influence on Traits
Engaging Experience 1
Title: Artificial Selection - Engage Hook
Suggested Length of Time: 15-30 minutes
Standards Addressed
  Priority:
  ● 6-8-LS4-3 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, and farming practices).]
Detailed Description/Instructions: See Artificial vs. Natural Selection Engage Hook. Use video: “Artificial vs. Natural Selection”
Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 2
Title: Artificial Selection - Explore Do 1 Activity
Suggested Length of Time: 30-45 minutes
Standards Addressed
  Priority:
  ● 6-8-LS4-3 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, and farming practices).]
Detailed Description/Instructions: See Artificial Selection - Explore Do 1 Activity. Students analyze trait cards to determine whether they represent artificial or natural selection.
Bloom’s Levels: Understand
Webb’s DOK: 2

Engaging Experience 3
Title: Artificial Selection - Explore: Do 2
Suggested Length of Time: 1-2 hours
Standards Addressed
  Priority:
  ● 6-8-LS4-3 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, and farming practices).]
**Detailed Description/Instructions:** See Artificial Selection - Explore: Do 2. Students use general physical and behavioral traits of dogs to artificially select a new breed of dog.

**Bloom’s Levels:** Evaluate

**Webb’s DOK:** 4

**Engaging Experience 4**

**Title:** Artificial Selection-Explore: Do 3

**Suggested Length of Time:** 2-3 hours

**Standards Addressed**

*Priority:*

- 6-8-LS4-3 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

[Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, and farming practices).]

**Detailed Description/Instructions:** See Artificial Selection - Explore: Do 3. Students select organisms to breed and use as a food source in a new planet.

**Bloom’s Levels:** Create

**Webb’s DOK:** 3

**Rubric:** Rubric embedded into student page of Scope
Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

See Artificial Selection- Explore: Do 4 PBL. Students select artificial selection techniques to save the declining bee population.

Engaging Scenario for Unit

Engaging Scenario (An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

See Natural Selection and Populations Scope - Evaluate: Performance Expectation Assessment Task

In this PEAT, students will construct an explanation for how genetic variation is related to localized species success, using data about the common house sparrow in North America as evidence. They will extend their explanations through the use of a mathematical model to show what could happen to the house sparrow population given a set of circumstances. Then students will gather and synthesize information about human influences on the house sparrow population to illustrate differences between selective breeding technology and genetic engineering technology.

**Note: Could have students choose to research about dogs or cats to increase engagement.

Summary of Engaging Learning Experiences for Topics
<table>
<thead>
<tr>
<th>Topic</th>
<th>Engaging Experience Title</th>
<th>Description</th>
<th>Suggested Length of Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influence of Environmental &amp; Genetic Factors on Growth</td>
<td>Growth of Plants Scope-Engage: Accessing Prior Knowledge</td>
<td>Students read three statements on the subject of growth in organisms and write a short explanation of what they consider correct and/or incorrect in each.</td>
<td>30 min</td>
</tr>
<tr>
<td>Influence of Environmental &amp; Genetic Factors on Growth</td>
<td>Growth of Plants Scope-Engage: Hook</td>
<td>Students brainstorm about plant adaptations and environmental conditions</td>
<td>30-45 min</td>
</tr>
<tr>
<td>Influence of Environmental &amp; Genetic Factors on Growth</td>
<td>Effect of Environment on New Life Form</td>
<td>Students use the scientific method to control the environmental conditions for a fictional alien organism in order to learn how the organism responds to changes in conditions. Sunlight, water, and temperature can be varied to determine their effects on the shape of the aliens.</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>Factors that Influence Successful Reproduction</td>
<td>Reproduction in Plants and Animals Scope-Engage Accessing Prior Knowledge</td>
<td>See Reproduction in Plants and Animals Scope Engage Accessing Prior Knowledge</td>
<td>15-20 min</td>
</tr>
<tr>
<td>Factors that Influence Successful Reproduction</td>
<td>Reproduction in Plants and Animals-Explore Do 1: Activity</td>
<td>Students observe various adaptations plants and animals have developed to help their species survive.</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>Factors that Influence Successful Reproduction</td>
<td>Reproduction in Plants and Animals-Explore Do 4: Engineering Solutions</td>
<td>Students design a flower to attract a chosen type of pollinator.</td>
<td>1-2 hours</td>
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<tr>
<td>Genetic Variation-Inheritance of Traits</td>
<td>Evolutionary History and Relationships</td>
<td>Students compare limbs of five different animals and discuss the differences and how those differences make that animal successful in its environment.</td>
<td>30 min</td>
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<tr>
<td>Genetic Variation-Inheritance of Traits</td>
<td>Natural Selection and Populations Scope-Engage: Hook</td>
<td>Students observe a series of cartoons demonstrating the conditions for natural selection</td>
<td>15-30 min</td>
</tr>
<tr>
<td>Genetic Variation-Inheritance of Traits</td>
<td>Natural Selection and Populations Scope-Explore: Do 2</td>
<td>Students match physical or behavioral traits to how the trait provides a survival advantage.</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>Genetic Variation-Inheritance of Traits</td>
<td>Evolutionary History and Relationships-Explore Do 2</td>
<td>Students will compare and contrast skeletal structures of ancestral lines of horses and dogs to identify cause and effect relationships, and to infer evolutionary relationships between modern and ancestral organisms.</td>
<td>30-60 min</td>
</tr>
<tr>
<td>Genetic Variation-Inheritance of Traits</td>
<td>Build-a-Bird Activity</td>
<td>Students will investigate how various bird beaks and feet are designed for specific habitats by building their own bird.</td>
<td>1-2 hours</td>
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<tr>
<td>Natural Selection</td>
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<td>Students are a bird hunting moths (both dark and light) that live on trees. As you capture the moths most easily visible against the tree surface, the moth populations change, illustrating the effects of natural selection.</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>Natural Selection</td>
<td>Natural Selection Work</td>
<td>Learning within the concepts of natural selection and adaptation.</td>
<td>1 hour</td>
</tr>
<tr>
<td>Human Influence on Traits</td>
<td>Artificial Selection-Engage: Hook</td>
<td>See Artificial vs. Natural Selection Engage: Hook</td>
<td>15-30 min</td>
</tr>
<tr>
<td>Human Influence on Traits</td>
<td>Artificial Selection-Explore Do 1: Activity</td>
<td>Students analyze trait cards to determine whether they represent artificial or natural selection.</td>
<td>30-45 min</td>
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<tr>
<td>Human Influence on Traits</td>
<td>Artificial Selection-Explore: Do 2</td>
<td>Students use general physical and behavioral traits of dogs to artificially select a new breed of dog.</td>
<td>1-2 hours</td>
</tr>
<tr>
<td>Human Influence on Traits</td>
<td>Artificial Selection-Explore: Do 3</td>
<td>Students select organisms to breed and use as a food source in a new planet.</td>
<td>2-3 hours</td>
</tr>
</tbody>
</table>

**Unit of Study Terminology**

**Appendices:** All Appendices and supporting material can be found in this course’s shell course in the District’s Learning Management System.
**Assessment Leveling Guide:** A tool to use when writing assessments in order to maintain the appropriate level of rigor that matches the standard.

**Big Ideas/Enduring Understandings:** Foundational understandings teachers want students to be able to discover and state in their own words by the end of the unit of study. These are answers to the essential questions.

**Engaging Experience:** Each topic is broken into a list of engaging experiences for students. These experiences are aligned to priority and supporting standards, thus stating what students should be able to do. An example of an engaging experience is provided in the description, but a teacher has the autonomy to substitute one of their own that aligns to the level of rigor stated in the standards.

**Engaging Scenario:** This is a culminating activity in which students are given a role, situation, challenge, audience, and a product or performance is specified. Each unit contains an example of an engaging scenario, but a teacher has the ability to substitute with the same intent in mind.

**Essential Questions:** Engaging, open-ended questions that teachers can use to engage students in the learning.

**Priority Standards:** What every student should know and be able to do. These were chosen because of their necessity for success in the next course, the state assessment, and life.

**Supporting Standards:** Additional standards that support the learning within the unit.

**Topic:** These are the main teaching points for the unit. Units can have anywhere from one topic to many, depending on the depth of the unit.

**Unit of Study:** Series of learning experiences/related assessments based on designated priority standards and related supporting standards.

**Unit Vocabulary:** Words students will encounter within the unit that are essential to understanding. Academic Cross-Curricular words (also called Tier 2 words) are those that can be found in multiple content areas, not just this one. Content/Domain Specific vocabulary words are those found specifically within the content.

**Symbols:**
- This symbol depicts an experience that can be used to assess a student’s 21st Century Skills using the rubric provided by the district.
- This symbol depicts an experience that integrates professional skills, the development of professional communication, and/or the use of professional mentorships in authentic classroom learning activities.