

# WEATHER & CLIMATE

*Kindergarten STEM Unit*



STEM

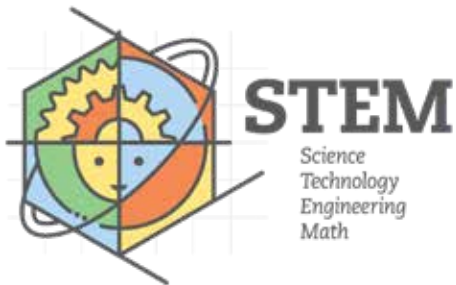




A digital copy of this document is available on the STEM Materials Center website at:  
<http://web3.esd112.org/stem-initiatives/stem-materials-center/earthkits>

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Parts of Lesson 3 have been adapted from *Made in the Shade* by Laura Kitagawa (NSTA Press Science and Children [January 2016], CC by SA)



# UNIT OVERVIEW

This integrated unit is intended to introduce kindergarten students to the patterns and variations in local weather. They will apply the science and engineering practices and crosscutting concepts to understand the following driving questions: *What is the effect of sunlight on the earth? What are the patterns of weather where you live? How does the weather forecast help us?*

Lesson No.	Duration	Standards	Materials Needed	Focus	Assessment Options
1	2 days	K-PS3-1 CCSS RI.K.1	<i>The North Wind and the Sun</i> (Aesop's Fable)	<p><b>Introduction to the Sun</b></p> <ul style="list-style-type: none"> <li>Read aloud <i>The North Wind and the Sun</i> <a href="https://www.storyarts.org/library/aesops/stories/north.html">https://www.storyarts.org/library/aesops/stories/north.html</a> <a href="https://www.youtube.com/watch?v=TrFUyAJXWLU">https://www.youtube.com/watch?v=TrFUyAJXWLU</a></li> <li>Create an Observe-Wonder-Learn chart. Complete the O and W sections.</li> </ul>	Begin the L section of the OWL
2	3 days	K-PS3-1	<p><i>The Sun, Our Nearest Star</i> by Franklin M. Branley</p> <p><i>The Sun is My Favorite Star</i> by Frank Asch</p>	<p><b>Determine the effect of sunlight on Earth's surface</b></p> <ul style="list-style-type: none"> <li>Read Aloud <i>The Sun, Our Nearest Star</i> and/or <i>The Sun is My Favorite Star</i>.</li> <li>Begin the L portion of the class OWL chart.</li> <li>Investigate how the sun warms the Earth by comparing the temperature of sand, soil, water, and rocks—before and after exposure to sunlight.</li> <li>Compare the substances based on their temperatures (warmer, hotter, cooler, colder).</li> <li>Use SunPrint paper to create leaf Sun Prints.</li> </ul>	<p>Science Notebook Entries</p> <p>OWL Chart</p>



# UNIT OVERVIEW (cont.)

<p><b>3</b></p>	<p>8-10 days</p>	<p>K-PS3-1 K-PS3-2 ETS1-1 ETS1-2 ETS1-3</p> <p>CCSS SL.K.2 CCSS SL.K.5 CCSS W.K.2</p>	<p>See Lesson 3 for complete list of materials for design challenge</p> <p>Wireless Temperature probe</p>	<p><b>Engineering Integration: Made in the Shade</b></p> <ul style="list-style-type: none"> <li>• Create a class Venn diagram to compare and contrast animal and human ways to protect from the Sun’s heat.</li> <li>• Investigate properties of materials to provide protection from the Sun.</li> <li>• Design and build a house to protect a UV-reactive animal from the Sun, applying criteria and constraints.</li> <li>• Test their solution to the engineering problem using appropriate tools.</li> </ul>	<p>Venn diagram</p> <p>Design product</p> <p>OWL Chart</p> <p>Student interviews</p>
<p><b>4</b></p>	<p>3 days + ongoing</p>	<p>K-ESS2-1 CCSS K.C</p>	<p><i>Storm is Coming</i> by Heather Tekevac</p> <p>Weather Tracking Charts.pptx</p>	<p><b>Track local weather over several weeks</b></p> <ul style="list-style-type: none"> <li>• Read aloud <i>Storm is Coming</i>.</li> <li>• Use the Weather Tracking Chart to track weather at school over a two week period, and discuss patterns.</li> <li>• Use the Weather Tracking Chart to track weather at an alternate location, such as New York City, over a two week period and compare.</li> <li>• Use the United States map to predict weather in different states based on the data collected.</li> </ul>	<p>Weather Tracking Chart</p>

# UNIT OVERVIEW (cont.)

5	3 days	K-ESS3-2	Internet access	<p><b>Weather forecasting and preparedness</b></p> <ul style="list-style-type: none"> <li>▪ Read various texts and view media on severe weather</li> <li>▪ Introduce meteorologists and the purposes of weather forecasting.</li> <li>▪ Visit <a href="http://www.ready.gov/kids">http://www.ready.gov/kids</a> and develop a class Preparedness Plan for Flooding or winter weather.</li> <li>▪ Discuss the types of severe weather that are common in different regions of the United States.</li> </ul>	Preparedness Plans
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# LESSON 1: Introduction to the Sun

*In this lesson, students build upon prior knowledge about the sun and its effects on Earth's surface through readings, partner talk and class discussions.*

## Strategy: Engage

Start the lesson outside and ask students to share what they already know and what they have observed about the sun (note: be sure to remind students not to look directly at the sun.)

What do they notice with their senses?

Begin a class OWL (Observe-Wonder-Learn) chart titled "The Sun and its Effects". Ask students to share what they know about the sun.

Add student questions to the W column. Allow for partner discussions.

## Strategy: Explore

Read aloud the Aesop's Fable "The North Wind and the Sun"

Ask students to respond in their notebooks, to the question "Who won the contest, the Sun or the North Wind?" Students should make a claim that answers the question and support their claim with evidence from the text.

### Materials Needed

Class OWL chart

Student notebooks

### Materials Needed

Student notebooks

Sentence starters or writing frames for Claim-Evidence





# LESSON 1: Introduction to the Sun (cont.)

## Strategy: Explain

View the Youtube video "[The Sun Song](#)." Guide a scientific discussion to help students identify some things that the sun does:

- Sunlight warms Earth's surface.
- The sun provides light and heat energy to the Earth.
- The sun is a big ball of gas and the only star in our solar system.

Add to the L column on the OWL chart.

## Strategy: Elaborate

Students can write a story explaining how the sun is an important part of our lives, incorporating details from the OWL chart.

## Strategy: Evaluate

Notebook entries. Students should be able to start the "L" column of the OWL chart, and begin to discuss claims and ask questions about the sun and its effects on Earth.

### Materials Needed

OWL chart  
Internet access

### Materials Needed

Student notebooks

### Materials Needed

OWL chart  
Student notebooks



# How Lesson 1 Supports Next Generation Science Standards



## K-PS3 Energy

*The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.*

Performance Expectation	Connections to Classroom Activity <i>Students:</i>
<a href="#">K-PS3-1</a> : Make observations to determine the effect of sunlight on the earth’s surface.	<ul style="list-style-type: none"> <li>Observe sunlight, ask questions based on prior knowledge, first-hand observations and key details in a text about the effects that the sun has on the earth and its inhabitants.</li> </ul>
<b>SCIENCE &amp; ENGINEERING PRACTICES</b>	
Asking Questions and Defining Problems	<ul style="list-style-type: none"> <li>Ask questions based on observations to find more information about the natural and designed world.</li> </ul>
<b>DISCIPLINARY CORE IDEAS</b>	
PS3.B: Conservation of Energy and Energy Transfer <ul style="list-style-type: none"> <li>Sunlight warms Earth’s surface.</li> </ul>	<ul style="list-style-type: none"> <li>Observe how the Sun provides solar energy in the form of light that travels in rays to the Earth.</li> </ul>
<b>CROSSCUTTING CONCEPTS</b>	
Cause and Effect	<ul style="list-style-type: none"> <li>Observe that sunlight has varying effects in different materials resulting in different amounts of heat.</li> </ul>





# LESSON 2: Determine the Effect of Sunlight on Earth's Surface

*In this lesson, students will plan and conduct an investigation to determine how sunlight effects the temperature of materials. They will examine data on a class chart and describe patterns.*

## Strategy: Engage

Prepare the white plastic bottle and the black plastic bottle with a balloon fitted over the top. With students observing, place the bottles outside in the sunlight.

Ask students to predict what they think might happen to the balloons.

Have students feel the outside of the bottles, then ask for some possible explanations.

Use the temperature probe to measure the temperatures inside the two bottles. Have students document this event into their science journals.

Leave the bottles outside in the direct sunlight for at least an hour, and then recheck the temperature. Have students record any changes and discuss possible causes for the variations in temperature.

Recheck the bottles at regular intervals, if possible. *(If direct sunlight is not possible, use a clamp lamp or other light source. Contact the SMC if you need materials.)*

### Materials Needed

Black and white bottles, balloons

Temperature probe

Student notebooks

# LESSON 2: Determine the Effect of Sunlight on Earth's Surface (cont.)

## Strategy: Explore

Read aloud *The Sun Our Favorite Star* by Frank Asch.

Add to the "L" portion of the OWL chart.

Measure the temperature of the substances and begin a class data chart. (*It's a great suggestion to ask student how they should keep track of this information during the experiment.*)

Place the substances in the sun for at least an hour. Measure and record the new temperatures.

## Strategy: Explain

Ask students what they notice about the data collected on temperature, and what might be the cause for their observations.

Show the video "Temperature" from BrainPop Jr, if your school has a subscription or from [PBS Kids](#).

Have students respond in their notebooks to the prompt "What causes the temperature of different substances to become hotter?"

### Materials Needed

Prepare 100ml of sand, soil, water and rocks for each group (or as a station).

Student notebooks and class data table

### Materials Needed

Student notebooks

Internet access

# LESSON 2: Determine the Effect of Sunlight on Earth's Surface (cont.)

## Strategy: Elaborate

Students will use the SunPrint paper to create sun prints of leaves. Use <http://www.sunprints.org/how-it-works/> for information on how it works.

Students can write a story explaining how the sun is an important part of our lives, incorporating details from the OWL chart.

## Strategy: Evaluate

Students should be able to record the charts into their notebooks.

Students should be able to make claims regarding the effects of sunlight on different materials. They should be able to cite as evidence the data collected during investigations.

### Materials Needed

Sunprint paper  
Acrylic sheet  
Cardboard  
A tub full of water  
Objects to print

### Materials Needed

Student writing



# How Lesson 2 Supports Next Generation Science Standards



## K-PS3 Energy

*The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.*

Performance Expectation	Connections to Classroom Activity <i>Students:</i>
<a href="#">K-PS3-1</a> : Make observations to determine the effect of sunlight on the earth’s surface.	<ul style="list-style-type: none"> <li>Observe and compare the effect of sunlight on a variety of different materials.</li> </ul>
<b>SCIENCE &amp; ENGINEERING PRACTICES</b>	
Planning and Conducting Investigations	<ul style="list-style-type: none"> <li>Conduct solar experiments to analyze the effect of the sun.</li> </ul>
<b>DISCIPLINARY CORE IDEAS</b>	
PS3.B: Conservation of Energy and Energy Transfer <ul style="list-style-type: none"> <li>Sunlight warms Earth’s surface.</li> </ul>	<ul style="list-style-type: none"> <li>Observe how the Sun provides solar energy in the form of light that travels in rays to the Earth.</li> <li>Observe that solar energy is converted into heat that warms the Earth (land, air, and water).</li> </ul>
<b>CROSSCUTTING CONCEPTS</b>	
Cause and Effect	<ul style="list-style-type: none"> <li>Observe that sunlight has varying effects in different materials resulting in different amounts of heat.</li> </ul>



# LESSON 3: Engineering Integration— Made in the Shade

*In this lesson, students will use the engineering design process to design and build a shade structure for a UV-reactive creature. They will observe that sunlight has varying effects in different materials resulting in different amounts of heat.*

## Strategy: Engage

Ask students how they think humans protect themselves from the sun, and how animals also do the same thing.

After reading, develop a class Venn diagram that compares and contrasts how humans and animals protect themselves from the sun.

## Strategy: Explore

Prepare enough UV-reactive creatures for each group of students to have one creature. (See instructional insert in kit for how to create the creatures.)

*(If you would like to have additional beads for all students to create their own creature, beads can be purchased online. Search for UV reactive pony beads.)*

Reveal one of the creatures and explain that your special friend is affected by the temperature of its surroundings. It likes to warm itself if the sun, but also hide in the shade to stay cool. Give each group of students their creature and allow them to share holding and observing (or use alternative

### Materials Needed

None

### Materials Needed

UV-reactive pony beads



# LESSON 3: Engineering Integration– Made in the Shade (cont.)

## Strategy: Explore (cont.)

extension on the next page) and take students outside with their creatures cupped in their hands and move to a sunny spot. All at once, open cupped hands to expose the creatures to the sun.

Allow time outside for testing the creatures’ response in different locations.

## ALTERNATIVE EXTENSION

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You can alternatively use an arts extension and allow students to develop their own creature given the same amount of materials listed on the Beaded Creature How-To sheet. Students could then draw a picture of their creature and design their shelter before you begin the engineering task. In their small groups, they could determine which solutions best fits the criteria and needs of the creature and build only the best solution.

## Strategy: Explain

Prepare 10 basic house models – each with a different roof. The house should be the cardboard base and 4 paper cups as columns. Choose 10 different roof materials and label them. Allow students to experiment with different levels of sunscreen.

Inside, direct students to the model houses. Have them predict and record which they believe will protect the creatures from the direct sunlight the most.

Have students in small groups place their creatures back inside the model houses and take them outside to test their predictions.

Record the data based on each roof style and how well it protected the creature.

### Materials Needed

Cardboard, paper cups

Roof materials

Class data table



# LESSON 3: Engineering Integration– Made in the Shade (cont.)

## Strategy: Elaborate

Explain to students that they will now have the chance to act as engineers and design a structure to protect their own creature. Their structure must have these criteria:

1. Use the same base as the model house did. (Students design the roof and sides.)
2. Have a door for the creature to come in and out of.
3. Protect the creature from as much sunlight as possible while it's inside.

Individually, have students draw their design ideas in their notebook and label the use of materials.

In small groups, have students present their ideas and choose the best possible option for satisfying the challenge. Each group can then present to the class – time permitting – and allow for suggestions and modifications.

Allow students to build their designs. They may make changes along the way but they should try to make a note of them in their notebooks at the end of each engineering session, and record why the change was important.

### Materials Needed

Large thick paper plate  
(base) – 1 per student

Small paper cups – 4  
per student

Craft sticks

#### Roof materials

Construction paper  
(variety of colors)

Cardboard

Aluminum foil

Wax paper

Felt

Clear plastic sheets

Sunscreen (SPF 8, 30,  
50)

Tape/glue/glue sticks

Markers/crayons/  
colored pencils

# LESSON 3: Engineering Integration– Made in the Shade (cont.)

## Strategy: Evaluate

Listen for peer interactions and conversation. Note students that struggle and ask guiding questions to clarify.

Students can test their structure designs outside in a consistent place. Do not grade the design solutions, but you can discuss which met the criteria the best.

Use the suggested rubric and conduct personal interviews with students.

### Materials Needed

Rubric

Teacher observations



# How Lesson 3 Supports Next Generation Science Standards



## K-PS3 Energy

*The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.*

Performance Expectation	Connections to Classroom Activity <i>Students:</i>
<p><a href="#">K-PS3-2</a>: Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area.</p>	<ul style="list-style-type: none"> <li>Design and build shade structures for UV-sensitive creatures.</li> </ul>
<b>SCIENCE &amp; ENGINEERING PRACTICES</b>	
<p>Developing and Using Models Constructing Explanations and Designing Solutions</p>	<ul style="list-style-type: none"> <li>Use models of house structures with different roof materials to compare and contrast the effects if the sun.</li> <li>Design and create shade structures using the most effective building materials.</li> </ul>
<b>DISCIPLINARY CORE IDEAS</b>	
<p>PS3.B: Conservation of Energy and Energy Transfer</p> <ul style="list-style-type: none"> <li>Sunlight warms Earth's surface.</li> </ul>	<ul style="list-style-type: none"> <li>Observe how the Sun provides solar energy in the form of light that travels in rays to the Earth.</li> <li>Observe that solar energy is converted into heat that warms the Earth (land, air, and water).</li> </ul>
<b>CROSSCUTTING CONCEPTS</b>	
<p>Patterns</p>	<ul style="list-style-type: none"> <li>Observe that shade structures can reduce the warming effects.</li> </ul>





# LESSON 4: Tracking Local Weather

*In this lesson, students will collect data on local weather conditions over time and use them to describe patterns.*

## Strategy: Engage

Read aloud *Storm is Coming* by Heather Tekevac.

Ask students to think of a time they were caught in the middle of a storm. Turn and tell your partner about the storm...How did you feel?"

## Strategy: Explore

What are some words we use to describe the weather?" [hot, cold, sunny, cloudy, rainy, etc.]

Explain that you are going to track the weather at your school to see how it changes from day to day. (Show the Weather Tracking Chart.)

Print one page versions of the Weather Tracking Charts to glue into the Science Notebooks.

Walk outside to observe and fill in the Weather Tracking Chart for that day. Repeat each day for at least two weeks.

At the end of each week, look for patterns. Ask:

- What do you notice?
- How many days were (sunny, cold, less than 60 degrees, etc.)?

### Materials Needed

Reading material

### Materials Needed

Weather tracking chart  
– using powerpoint slide or projector, or class data chart

Student notebooks with weather charts pasted inside for individual recording



# LESSON 4: Tracking Local Weather (cont.)

## Strategy: Explain

Develop a class definition of weather. What are the characteristics? How do we know what the weather is?

*Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns.*

### Materials Needed

None

## Strategy: Elaborate

You can use the Weather Tracking Chart and [www.weather.com](http://www.weather.com) to observe and record the daily weather for two weeks in a different location, such as New York City.

Compare and discuss possible reasons for the differences in weather in Washington and New York.

Use a United States map to identify our country, state, and city. Point out New York and some other major cities/states. Make predictions about the weather in some other states based on their location on the map.

Allow students to build their designs. They may make changes along the way but they should try to make a note of them in their notebooks as they go, and remember why they change was used.

### Materials Needed

Internet access

## Strategy: Evaluate

Students should be able to complete the weather tracking charts in their notebooks.

Students should be able to identify patterns of weather based on the season.

### Materials Needed

Student notebooks

# How Lesson 4 Supports Next Generation Science Standards



## K-PS3 Energy

*The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.*

Performance Expectation	Connections to Classroom Activity <i>Students:</i>
<p><a href="#">K-ESS2-1</a>: Use and share observations of local weather conditions to describe patterns over time.</p>	<ul style="list-style-type: none"> <li>Track, record and discuss observations of local weather conditions to describe patterns over time.</li> </ul>
<b>SCIENCE &amp; ENGINEERING PRACTICES</b>	
<p>Analyzing and Interpreting Data</p>	<ul style="list-style-type: none"> <li>Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.</li> </ul>
<b>DISCIPLINARY CORE IDEAS</b>	
<p>ESS2.D: Weather and Climate</p>	<ul style="list-style-type: none"> <li>Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time.</li> </ul>
<b>CROSSCUTTING CONCEPTS</b>	
<p>Patterns</p>	<ul style="list-style-type: none"> <li>Use patterns in the natural world that can be observed, used to describe phenomena, and used as evidence.</li> </ul>





# LESSON 5: Preparing for Severe Weather

*In this lesson, students will ask questions and then obtain and communicate information that weather forecasting can be used to prepare for severe weather that affects the local community.*

## Strategy: Engage

View clips of a meteorologist forecasting the weather. Ask students why it's important to forecast weather.

## Strategy: Explore

Do you know of any types of severe weather in our area – or other parts of the country where your family or friends live?

From the school or class library, read selections on weather that can affect your local community: flooding in spring/fall, ice and snow in winter, extreme heat in summer.

Ask students to think of some ways that people across the country prepare for severe weather?

### Materials Needed

Internet access

### Materials Needed

Internet access

Access to various texts on severe weather

Possible resources:

True Story: [Wild ride During a Flash Flood](#)



# LESSON 5: Preparing for Severe Weather (cont.)

## Strategy: Explain

Visit <http://www.ready.gov/kids> to learn about preparing for severe weather. Click on “See What’s Happening in Your State” and click on Washington to read about flooding, winter storms and thunderstorms, our local forms of severe weather. Share with students:

*If a heavy rain produces a flood, we may lose power, we may not be able to travel and our property could be extremely damaged. Meteorologists help us know when a flood is coming so we can be prepared. What might we need to include in our flood preparedness kit?*

Click on the various tabs on the website to learn more and to create a list of what to include in a class Flood/Winter weather Preparedness Kit.

## Strategy: Elaborate

Visit <http://www.ready.gov/kids> and click again on “See What’s Happening in Your State.” Click on states in various regions to find out which types of severe weather are common.

HOME-SCHOOL CONNECTION: Ask the families to develop a Severe Weather Preparedness Plan for friends in other states or parts of the world.

## Strategy: Evaluate

Students will write a narrative reflecting in their Severe weather preparedness plans.

### Materials Needed

Internet access

Online resources:

- [Winter Weather Safety](#)
- [Flood Safety](#)
- [Build a Kit \(online game\)](#)

### Materials Needed

Internet access

### Materials Needed

Student notebooks

# How Lesson 5 Supports Next Generation Science Standards



## K-PS3 Energy

*The materials/lessons/activities outlined in this activity are just one step toward reaching the Performance Expectations listed below. Additional supporting materials/lessons/activities will be required.*

Performance Expectation	Connections to Classroom Activity Students:
<a href="#">K-ESS3-2</a>	<ul style="list-style-type: none"> <li>Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, local forms of severe weather.</li> </ul>
<b>SCIENCE &amp; ENGINEERING PRACTICES</b>	
Asking questions and designing solutions Obtaining, combining and communicating information	<ul style="list-style-type: none"> <li>Ask questions based on observations to find more information about the designed world.</li> <li>Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world.</li> </ul>
<b>DISCIPLINARY CORE IDEAS</b>	
ESS3.B Natural Hazards	<ul style="list-style-type: none"> <li>Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events.</li> </ul>
<b>CROSSCUTTING CONCEPTS</b>	
Cause and Effect	<ul style="list-style-type: none"> <li>Recognize that events have causes that generate observable patterns.</li> </ul>

