

Lessons 4–7

Describing Weather

Prepare

In Lessons 4 through 7, students build on what they learned in the previous lesson as they describe the weather in terms of cloud cover, rain and snow, temperature, and wind. In Lesson 4, students observe and sort photographs to compare and describe cloud cover and snow or rain in the same place at different times. In Lesson 5, students learn how to use a thermometer to measure and compare temperatures. Lessons 6 and 7 introduce students to the engineering design process as they develop a tool that they can use to measure and compare relative wind speed. The class then begins a yearlong investigation in which they observe, measure, describe, and record cloud cover, rain and snow, temperature, and wind. In Concept 2 and at the end of the school year, students will use their recorded weather data to analyze and identify patterns in weather over time.

Student Learning

Knowledge Statement

People can observe or measure cloud cover, rain and snow, temperature, and wind to describe the weather.

Concept 1: Parts of Weather

Focus Question

What is weather?

Phenomenon Question

How can we describe the weather?



Objectives

- Lesson 4: Record observations of cloud cover, rain, and snow.
- Lesson 5: Learn how to use a thermometer to measure temperature.
- Lesson 6: Design a tool to measure the wind.
- Lesson 7: Create, improve, and share a wind measuring tool.

Texas Essential Knowledge and Skills Addressed

- 1.2B **Plan and conduct simple descriptive investigations.** (Introduced)
- 1.2C **Collect data and make observations using simple tools.** (Introduced)
- 1.2D **Record and organize data using pictures, numbers, and words.** (Introduced)
- 1.2E **Communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations.** (Introduced)
- 1.3A **Identify and explain a problem and propose a solution.** (Introduced)
- 1.3C **Describe what scientists do.** (Introduced)
- 1.4A **Collect, record, and compare information using tools,** including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, notebooks, and **safety goggles** or chemical splash goggles, **as appropriate;** timing devices; **non-standard measuring items; weather instruments such as demonstration thermometers and wind socks;** and materials to support observations of habitats of organisms such as aquariums and terrariums. (Introduced)
- 1.5A **Classify objects by observable properties** such as larger and smaller, heavier and lighter, shape, color, and texture. (Introduced)
- 1.6C **Demonstrate and record the ways that objects can move such as in a straight line, zig zag, up and down, back and forth, round and round, and fast and slow.** (Introduced)
- 1.8A **Record weather information, including relative temperature such as hot or cold, clear or cloudy, calm or windy, and rainy or icy.** (Addressed)



- 1.8B **Observe and record** changes in the **appearance of objects in the sky**, such as the Moon and stars, **including the Sun**. (Addressed)
- 1.8D Demonstrate that air is all around us and **observe that wind is moving**. (Introduced)

English Language Proficiency Standards Addressed

- 1C Use strategic learning techniques such as concept mapping, drawing, memorizing, comparing, contrasting, and reviewing to acquire basic and grade-level vocabulary.
- 4A Learn relationships between sounds and letters of the English language and decode (sound out) words using a combination of skills such as recognizing sound-letter relationships and identifying cognates, affixes, roots, and base words.

Materials

		Lesson 4	Lesson 5	Lesson 6	Lesson 7
Student	Science Logbook (Lesson 4 Activity Guide)	•			
	Weather cards (1 set per group)	•			
	Science Logbook (Lesson 3 Activity Guide)	•			
	Thermometer exploration (1 set per student pair): prepared disposable insulated cups with paper plate stands (2), safety goggles (2), paper towels, prepared student thermometer (1)		•		
	Science Logbook (Lesson 5 Activity Guide)		•		
	Wind measuring tool activity (1 set per student pair): clothespins (2), ruler (1), safety goggles (2), prepared wind measuring tool materials (1 of each material)			•	•
	Science Logbook (Lesson 6 Activity Guides A and B)			•	•
	Science Logbook (Lesson 7 Activity Guide)				•
Teacher	Class card sort: chart paper (2 sheets), glue or tape, marker (1), weather cards (2 sets)	•			

Weather calendar preparation: 9" × 12" construction paper in blue, green, orange, purple, red, and yellow (3 sheets of each color), days of the week cards (7), month cards (12), number cards (31), ruler (1), scissors (1), weather calendar pocket chart (1), weather symbols from Lesson 4 Resource B (1 to 3 copies of each page, as specified in resource instructions)	•	•	•	•
Indoor-outdoor thermometer preparation: 2" wide clear packing tape or laminating machine, color copy of color strip from Lesson 5 Resource A (1), scissors (1), indoor-outdoor thermometer (1)		•	•	•
Student thermometers preparation: 2" wide clear packing tape or laminating machine, color copy of color strip from Lesson 5 Resource B (1 per student pair), scissors (1), stapler (1), student thermometer (1 per student pair)		•		
Demonstration thermometer preparation: construction paper or card stock in blue, green, orange, purple, red, and yellow (1 sheet of each color), black marker (1), ruler (1), scissors (1), tape, demonstration thermometer (1)		•		
Temperature comparison demonstration preparation: 12 oz disposable insulated cups (3), ice cubes (2), marker (1), paper towels, safety goggles (2), sticky notes (3), prepared student thermometer (1), cold water (8 oz), hot water (8 oz), room temperature water (8 oz)		•		
Thermometer exploration cups with stands preparation: 7" rimmed heavy paper plates (2 per student pair), 12 oz disposable insulated cups (2 per student pair), marker (1), pencil (1), scissors (1), sticky notes (2 per student pair)		•		
Thermometer exploration water preparation: large insulated container for cold water (1), large insulated container for hot water (1), ice cubes (about 50), prepared student thermometer (1), access to water		•		
Wind measuring tool material preparation: 1" flagging tape (9 ft), 9" × 12" craft foam sheet (1), 9" × 12" felt (1), 9" × 12" manila envelope (1), 9" × 12" tissue paper (1), scissors (1), yarn (9 ft)			•	
Wind measuring tool testing supplies: access to an electrical outlet, table fan (1), hair dryer with a cool setting (1)			•	•
Engineering Design Process Visual (Lesson 6 Resource B)			•	•
Sticky note or magnet (1)			•	•

	Daily weather recording sheet preparation: color copy of daily weather recording sheet from Lesson 7 Resource A (1), clipboard (1), dry erase marker (1), sheet protector (1)				•
	Temperature and weather logs preparation: color copy of temperature log from Lesson 7 Resource B (1), copy of weather log from Lesson 7 Resource B (1), marker				•
Preparation	Prepare weather cards. (See Lesson 4 Resource A.)	•			
	Prepare weather calendar. (See Lesson 4 Resources B and C.)	•			
	Prepare indoor-outdoor thermometer, student thermometers, and demonstration thermometer. (See Lesson 5 Resources A, B, and C.)		•		
	Prepare materials for temperature comparison demonstration. (See Lesson 5 Resource D.)		•		
	Prepare materials for thermometer exploration. (See Lesson 5 Resource E.)		•		
	2 Days Before: Arrange for an adult to operate the fan and hair dryer during the wind measuring tool activity.			•	•
	Prepare materials for wind measuring tool activity. (See Lesson 6 Resource A.)			•	
	Cue flag in wind and flag in weak wind videos: http://phdsci.link/1510 and http://phdsci.link/1511 .			•	
	Prepare materials for daily weather report. (See Lesson 7 Resources A and B.)				•

Lesson 5

Objective: Learn how to use a thermometer to measure temperature.

Launch 5 minutes

Display the prepared materials for the temperature comparison demonstration, and ask for two student volunteers.



Safety Note

This demonstration poses potential hazards. To minimize the risk, review these safety measures and look for evidence that student volunteers are following them (1.1A):

- Wear goggles at all times to prevent eye injury.
- If water spills, make sure it is immediately cleaned up to prevent slips and falls.
- Wash your hands immediately after completing the demonstration.

Start the demonstration by explaining that hot water and cold water look the same and that students should never stick their fingers into water of unknown temperature because it can harm students' skin. Assure students that the water temperature in these cups is safe. Ask one student volunteer to place a finger in the cold water in Cup A. Ask the other student to place a finger in the hot water in Cup B. Have both students keep their fingers in the water for at least 20 seconds. While they are holding their fingers in the cups of water, ask each student to say whether the water feels hot, cold, warm, or cool.

Sample student response:

- *The water in my cup water feels cold.*

Agenda

Launch (5 minutes)

Learn (23 minutes)

- Explore Thermometers (13 minutes)
- Act Like a Thermometer (10 minutes)

Land (7 minutes)

- *My water feels hot.*

After 20 seconds, have both students move their fingers from their respective water cups into Cup C, which contains room-temperature water. Ask both students to share how the water in Cup C feels. 

Sample student response:

- *This water feels warm.*
- *The water feels cool.*

Ask the class to respond to the following question.

- What do you wonder about the water in Cup C?
 - *Is the water in Cup C warmer than the water in Cup A?*
 - *Is the water in Cup C cooler than the water in Cup B?*
 - *How can the water in Cup C be warm and cool at the same time?*

Explain that the two students used their sense of touch to feel how warm or cool the water was. Point out that even though both students had their fingers in the same cup of water, the water did not feel the same to them.

- Imagine that you want to go for a swim and your friend describes the temperature of the water to you. How might your friend's words change what you do?
 - *I would want to go swimming in warm water but not water that is too hot or cold.*
 - *If my friend said the water was cold, I might want to test it with my foot to see if I think it feels cold too.*

Build on student responses to conclude that there are times when it is helpful to know exactly how warm or cool something is. Explain that if two people both use the same words to describe the temperature, it is easier for them to understand each other. Tell students that in this lesson, they will explore how they can describe temperature by using the same words as their classmates.



Teacher Note

If student volunteers do not differ in their perceptions of the relative temperature of the water in Cup C, consider having a student place one finger in Cup A and another finger in Cup B at the same time. After 30 seconds, have the student place both fingers in Cup C and describe any differences they notice.

Learn 23 minutes

Explore Thermometers (13 minutes)

Hold up the prepared indoor-outdoor thermometer with labeled color bands.



Explain that the way the temperature may feel can differ from one person to the next, which is why scientists use a tool called a **thermometer** to measure temperature.



English Language Development

Introduce the terms *thermometer* and *measure* explicitly. Providing the Spanish cognate for *thermometer* (*termómetro*) may be helpful (4A).

Explain that a thermometer is a tool that people use to measure how hot or cold something is, just as a ruler is a tool that people use to measure how long or short something is.

Students may benefit from participating in a familiar example of measuring. For example, have two students stand back-to-back, and ask students, “If I were to measure these two students, who would be taller? Who would be shorter?”

- Where have you seen a thermometer before?
 - *We have a thermometer outside our house.*
 - *A doctor uses a thermometer to take my temperature when I’m sick.*

► What do you see on this thermometer? 

- *I see numbers and lines on the side.*
- *I see a red line in the middle.*
- *I see colors on the side.*

Tell students that before they can measure temperature outside to describe the weather, they must first learn how to use a thermometer. While holding the indoor-outdoor thermometer, point out the glass tube, the glass bulb at the bottom that is filled with red liquid, and the line of red liquid in the tube. Show students the correct way to hold the thermometer so that it is vertical with the bulb at the bottom. Then point out the color bands along the side of the thermometer. Explain that the color bands represent different temperatures. 

► What do you think this thermometer is measuring the temperature of right now? What makes you think that?

- *I think it is measuring the air around us.*
- *I think it's measuring the temperature of the air because nothing else is touching it.*

Confirm that the thermometer is measuring the temperature of the air in the classroom.  Then ask students to look closely at the glass tube and find the top of the red line. Have students identify the color band next to the top of the red line. Invite several students to share their color band reading. Come to an agreement as a class on which color band corresponds with the temperature of the air in the classroom.

Tell students they will now explore and use a thermometer to measure the temperature of other items in the classroom. Discuss with the class the safety expectations for using thermometers.



Differentiation

Students with color vision deficiencies, commonly known as color blindness, may need support during this activity. The National Science Teaching Association website provides resources to help students with color vision deficiencies: <http://phdsci.link/1512>.



English Language Development

Students encounter the term *represent* throughout the module. Provide a student-friendly explanation, such as “To represent means to be a sign or a symbol of something.” Consider also sharing examples of the word *represent* in different contexts, such as these (4A):

- When we draw how many objects there are, we represent how many.
- When we draw a happy face or a sad face, we represent how we feel.



English Language Development

Students encounter the term *air* throughout the module. Providing the Spanish cognate *aire* may be helpful. Consider sharing a student-friendly explanation, such as “Air is all around us. We breathe air in and out (4A).”

**Safety Note**

This activity poses potential hazards. Explain that thermometers are made of glass, which can break and cause injury. To minimize the risk, review these safety measures and look for evidence that students are following them (1.1A):

- Wear goggles throughout the activity.
- Handle thermometers with care. Never put a thermometer in your mouth. Do not tap a thermometer on any surface or on anyone's body. Pass thermometers gently, without grabbing.
- If a thermometer breaks, tell an adult right away. Do not touch the broken pieces.
- If water spills, tell an adult right away.
- Do not drink the water or take the ice cubes out of the cup.
- Wash your hands as soon as the activity is over.

Place students in pairs, and distribute a student thermometer and prepared Cup A and Cup B to each pair. Explain that these thermometers are measuring the temperature of the air just like the indoor-outdoor thermometer did. Provide students time to observe their thermometers.

Next, for each student pair, add cold water to fill about one-third of Cup A. Also add 2 ice cubes to each cup. Prompt a student in each pair to place one finger in the water and describe to their partner how the temperature feels.

► What do you think will happen if we put a thermometer in the water in Cup A?

- *I think the red line will move.*
- *I think the red line is going to move, but I don't know if it will go up or down.*

Demonstrate how to place a thermometer in a cup of water. Instruct one student from each pair to place their thermometer in Cup A, and have all students observe and discuss with their partner what happens to the red line. Tell students not to touch their thermometer until the red line stops moving.

As students work, circulate to ensure that they are using thermometers safely and to help students identify which color band lines up with the top of the red line after the liquid in the thermometer stops moving. If needed, prompt students with the following questions: What happened? Did the red line move up or down? What color band is the top of the red line next to now?

Prompt students to find in their Science Logbooks (Lesson 5 Activity Guide) the thermometer image labeled Cup A.  Have students draw a red line in the tube on the Cup A thermometer image so it looks

**Teacher Note**

Consider options to minimize the risk of spilling water on Science Logbooks during this activity. For example, have students place their Science Logbooks away from the cups until students need their Science Logbooks.

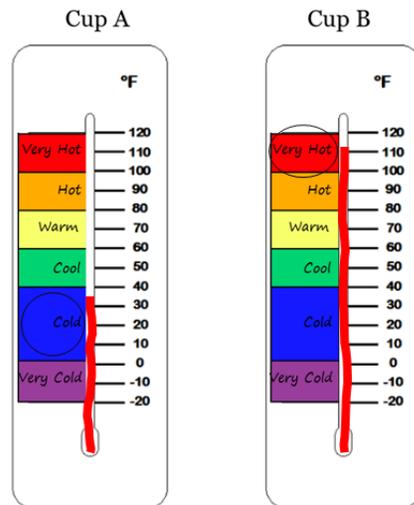
like the red line on their thermometer. Then instruct student pairs to identify the color band next to the top of the red line on their thermometer, and ask students to circle the matching color band in their Science Logbooks. As students work in their Science Logbooks, add hot water to fill about one-third of Cup B for each student pair.

Next, instruct one student in each pair to place a finger in Cup B and describe to their partner how the water feels.

- What do you think will happen if we put a thermometer in the water in Cup B?
 - *I think the red line will move again.*
 - *I think the red line will move up.*

Prompt a student from each pair to take their thermometer out of Cup A and immediately place it into the water in Cup B. Have student pairs again observe and discuss what happens. When the red line stops moving, have students find in their Science Logbooks the thermometer image labeled Cup B. Ask students to draw a red line in the tube on the Cup B thermometer image so it looks like the red line on their thermometer now. Then ask students to identify the color band that is next to the top of the red line and circle the matching color band in their Science Logbooks.

Sample student response: 



Teacher Note

Depending on how long the activity takes, the water in Cup B may cool from the red (very hot) band to the orange (hot) band.

After students complete their Science Logbooks, provide time for student pairs to move their thermometer back and forth between their cups and observe how the red line moves. 

Act Like a Thermometer (10 minutes)

Bring the class back together. Invite students to Think–Pair–Share with someone other than the partner they worked with during the thermometer exploration.

► How did the thermometer change when you placed it in each cup of water?

- *The red line moved down when it was in Cup A.*
- *Then the red line moved way up when I put it in Cup B.*

Ask students to point to the thermometer in their Science Logbooks (Lesson 5 Activity Guide) that shows a warmer temperature.

► How do you know which cup contained warmer water?

- *The water in Cup B felt warmer than the water in Cup A when I put my finger in it.*
- *The red line on the thermometer went all the way up to the red band when it was in Cup B. It only went to the blue band when it was in Cup A.*



Extension

When students are familiar with how to use a thermometer safely and responsibly, consider setting up temperature exploration stations, where students can measure additional cups containing water at various temperatures.



Check for Understanding

Students use thermometer measurements to compare water temperatures.

Evidence	Next Steps
<p>Students use thermometers to take measurements of water temperature in Cup A and Cup B and compare the data to identify which thermometer shows a warmer temperature.</p>	<p>If students point to the thermometer image for Cup A instead of Cup B, check that the thermometer images in their Science Logbooks show that the red line for the Cup B thermometer is higher than the red line for the Cup A thermometer. If students' images do not show this, have students place a thermometer in Cup A and Cup B at the same time so they can directly compare the red lines.</p>
<p>Students use the temperature data to identify that the water in Cup B is warmer.</p>	<p>If students need support describing how they know which cup of water is warmer, provide a sentence stem such as the following: I think the temperature of the water in Cup __ is warmer because ____.</p>

Work with students to come to an agreement as a class that the water in Cup B was warmer than the water in Cup A. Summarize that although feeling the water helped students detect how warm or cool it was, their thermometer allowed them to measure the temperature of the water.

Show students the prepared demonstration thermometer.



Explain that the demonstration thermometer is a model of a real thermometer. Tell students that they can use the demonstration thermometer to show how the red line moves when a thermometer measures different temperatures. Demonstrate how to move the red line up and down.

► When the red line goes up or down, what does that mean?

- *The temperature is changing.*
- *The temperature is getting warmer or cooler.*

Tell students that they are going to act like the red line in a thermometer. Demonstrate how students should stand up and stretch their hands high when they hear about something that is hot and crouch low when they hear about something that is cold.

Start by asking students to act out what happened to the red line when they placed the thermometer in the cold water in Cup A. Then have students act out what happened to the red line when they placed the thermometer in the hot water in Cup B. Use the demonstration thermometer to mirror students' movements by shifting the red line down to the blue color band and then up to the red color band.

Name additional hot or cold items, and have students act out what the red line on the thermometer would do if the thermometer were measuring the temperatures of those items. For each item, model the movement of the red line with the demonstration thermometer. Possible items may include the following: 

- Hot chocolate



Teacher Note

To provide additional support, name familiar hot and cold items (e.g., items from a familiar story), or display a picture of each hot or cold item.

- Ice cream
- Soup
- Snow

After students act out the red line moving up and down for a few items, place students in pairs. Ask students to take turns naming a hot or cold item while their partner acts like the red line in a thermometer. After both partners have named an item and acted like the red line, have them compare the two items and decide which is warmer and which is cooler.

Land 7 minutes

Bring the class together. Display the indoor-outdoor thermometer, and remind students that it is measuring the air temperature in the classroom.

Ask students to close their eyes. Then invite them to act out what they think would happen to the red line in the thermometer if they took the thermometer outside. When everyone has responded, ask students to freeze in place and open their eyes. Invite students to look around to see how others showed the outside temperature. Point out differences, and explain to students that they can describe temperature as very hot, hot, warm, cool, cold, and very cold. Use the indoor-outdoor thermometer to point out that each temperature description corresponds to a color band.  Tell students that they will use the indoor-outdoor thermometer to measure the outside temperature each day.

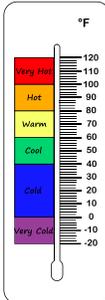
Update the parts of weather chart by adding a row for temperature. Sketch a thermometer with labeled color bands or attach a photograph of one.

Sample class chart:

Parts of Weather	How can we describe the weather?
Cloud cover	 Sunny

Extension

Consider having students identify clothing they would typically wear outside when the temperature is within each of the color bands.

	 Partly sunny  Cloudy
Rain or snow	 Raining  Snowing
Temperature	

Determine the current outside temperature at the school’s location by using either the indoor-outdoor thermometer or an online weather resource. Adjust the red line on the demonstration thermometer to show students the current outside temperature. Have students identify the corresponding color band and temperature description on the thermometer.

Show students how to record the temperature on the weather calendar. Select a colored paper square that matches the color band for the thermometer reading, and invite a student to place the square into the pocket for today’s date. Add relevant symbols for cloud cover and, if applicable, rain or snow. Tell students that from now on, they will continue to record the temperature each day on the weather calendar, along with information about cloud cover as well as rain or snow. 📅

Invite students to share new questions they have about weather.



Teacher Note

Keep the demonstration thermometer on display near the weather calendar, and use the thermometer to model the temperature each day.

Sample student responses:

- *Will we record how windy it is outside too?*
- *How does the temperature change during the day?*

Record relevant questions on sticky notes and add the sticky notes to the driving question board.