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 6

Objective: Design a tool to measure the wind.

Agenda

Launch (5 minutes)

Learn (23 minutes)

- Ask about a Problem (5 minutes)
- Imagine a Wind Measuring Tool (13 minutes)
- Plan a Wind Measuring Tool (5 minutes)

Land (7 minutes)

Launch 5 minutes

Play the video of a flag moving in the wind (http://phdsci.link/1510). Prompt students to use their bodies to act out how the flag moves in the video.

▶ What do you think makes the flag move? Why do you think that?

- *I think wind makes the flag move. I've seen our school flag move in the wind.*
- *Wind makes the flag move because it blows the flag around.*

Confirm that wind makes the flag move and explain that wind is moving air. Ask students to think silently about how they would describe the wind in the video. Replay the video if needed. Then have students share their description with a partner.

▶ What did you and your partner say to describe the wind? Did you and your partner describe the wind in the same way?

- *We both said it was very windy.*
- *We kind of said the same thing, but my partner said there was a lot of wind and I said the wind was strong.*

Play the video of a flag moving in weak wind (http://phdsci.link/1511). Prompt students to act out how the flag moves. Then ask students to think about how to describe the wind in this video, and have them share their description with a partner.

Differentiation

Consider sharing a list of descriptive words and phrases that students can refer to, such as *windy*, *very windy*, *not windy, blowing hard*, and *blowing lightly* (1C).

▶ What did you and your partner say to describe the wind? Did you and your partner describe the wind in the same way?

- *We both thought there wasn't much wind.*
- *I said the wind was weak, and my partner said it was a little windy.*

Highlight differences that students mention about how they described the wind in the videos. Revisit the Phenomenon Question **How can we describe the weather?** Tell students that in this lesson they will explore ways to measure and describe the wind.

Learn 23 minutes

Ask about a Problem (5 minutes)

Display the weather calendar. Remind students that they know how to record descriptions for cloud cover, rain and snow, and temperature. Explain that the class will start recording a description of the wind each day too.

▶ What questions do you have about describing the wind on our weather calendar?

- *Can we use symbols like we do for clouds and rain?*
- *What is today's wind like?*

▶ Why do you think we haven't added wind to our weather calendar yet? ✓

- *We don't know how to show how much wind there is.*
- *We don't know how windy it is today.*

Summarize that the class needs a way to measure the wind before they can record wind descriptions on the weather calendar. Begin a class problem and solution chart that will have three columns. Record the problem in the first column, and leave space to add two additional columns to the right later in the lesson.

Next, display the indoor-outdoor thermometer.

Check for Understanding

Listen for students to state a problem that relates to how to measure the wind or describe the wind.

Students will practice defining a simple problem again during the Engineering Challenge in Lessons 12 through 16.

Teacher Note

Leave this chart displayed through Lesson 7 so the class can refer to it and make updates. Consider including pictures on the chart, such as a flag blowing in the wind.

▶ How do we use a thermometer to measure temperature?

- *The red line tells us the temperature. It goes up when it's warmer and down when it's cooler.*
- *We look at the red line and record the color of the band.*

▶ How do you think we could measure the wind?

- *Maybe there is a tool that measures the wind like a thermometer measures temperature.*
- *We need a tool that measures the wind.*

Confirm that to solve the problem, the class needs to make a tool to measure the wind. Record the solution in the second column of the class problem and solution chart.

▶ How will we know if our wind measuring tool works?

- *We will have to try it in the wind.*
- *It should show us how windy it is.*

Tell students that they will need to test their tool to make sure that it works. Remind students how the flags in the videos from the Launch moved differently depending on how hard the wind was blowing. Explain that the students' tools should not move when it is not windy, should move a little when it is a little windy, and should move a lot when it is very windy. Add this information to the third column of the class chart.

Sample class chart:

What is the problem?	What is the solution?	How will we know whether the solution works?
We need to measure the wind.	*We need a wind measuring tool.*	*The tool will not move when it is not windy. The tool will move a little when it is a little windy. The tool will move a lot when it is very windy.*

Teacher Note

If students suggest using a flag to measure the wind, tell them that they may not always have access to a flag. Explain that they need to create a wind measuring tool that they can use when a flag is not accessible.

Teacher Note

Students will use their wind measuring tool to make relative measurements of wind speed similar to the Beaufort scale. More information about the Beaufort scale is available on the National Weather Service website: http://phdsci.link/1554.

English Language Development

Students will encounter the term *solution* throughout the module. Providing the Spanish cognate *solución* may be helpful. Consider sharing a student-friendly explanation, such as "A solution is a way to solve a problem (4A)."

Imagine a Wind Measuring Tool (13 minutes)

Tell students that they will work in pairs to create a wind measuring tool. Explain that each pair of students will receive a set of materials to create their tool. Display and introduce to students the prepared materials.

Next, gather students around the fan and the hair dryer. Turn on the fan and the hair dryer. Set the fan on low speed.

▶ How can we use the fan and hair dryer to test our wind measuring tools?

- *They blow like the wind, so we can use them to test our tools.*
- *We can hold different materials in front of them and see how the materials move.*

Confirm that the fan and hair dryer move air and that students can use that moving air to represent the wind. Leave the fan and hair dryer on, and select one material available for students to use (e.g., a tissue paper strip). Hold the material 1 foot in front of the fan. Then hold the same material 1 foot in front of the hair dryer.

▶ How do you think the wind from the fan compares with the wind from the hair dryer?

- *The fan makes a little wind, and the hair dryer makes a lot of wind.*
- *The wind from the hair dryer is stronger than the wind from the fan.*

Summarize that students can use the fan to test how materials move when it is a little windy and they can use the hair dryer to test how materials move when it is very windy.

Place students in pairs. Explain that before they make a wind measuring tool, they will explore how the air from the fan and air from the hair dryer make different materials move. Review safety procedures for testing the materials.

English Language Development

Students may need support with understanding the term *materials*. Sharing the Spanish cognate *materiales* may be helpful. Explain that materials are anything used for making or building something else. As each material is introduced, refer to it by using the word *material*. For example, "This material is tissue paper." (4A)

Safety Note

This activity poses potential hazards. Explain that the fan and hair dryer have fast-moving parts, can become hot, and can blow objects into eyes. Be sure the hair dryer is set to the coolest setting during the activity. To minimize the risk, review these safety measures and look for evidence that students are following them (1.1A):

- Wear goggles throughout the activity.
- Only adults may hold and use the hair dryer or turn the fan on and off.
- Do not move the fan from the table.
- Tie back long hair before getting near the fan or hair dryer.
- Keep your fingers and other objects at least 1 foot away from the fan and hair dryer.
- Do not touch any part of the fan, hair dryer, electrical cords, or outlet.
- When testing materials, stand to the side of the fan or hair dryer.

Teacher Note

At least one adult must always be stationed in the testing area. The adult must turn the hair dryer and fan on and off for students and hold the hair dryer when students test materials. The fan may run throughout the testing time, but an adult must supervise students using the fan to test materials.

Instruct each student pair to gather one of each prepared material: craft foam, felt, flagging tape, manila envelope, tissue paper, and yarn. Tell students that they will record in their Science Logbooks (Lesson 6 Activity Guide A) how each material moves. Before they begin testing the materials, have students draw and color in a picture of each material in the first column of the table. After students have drawn the materials, ask students to notice how each material feels. Then tell students to select with their partner one or two of the materials to test. Allow students to test materials by holding them 1 foot in front of the fan or hair dryer.

After students test each material, ask them to work with their partner to record in their Science Logbooks (Lesson 6 Activity Guide A) how the material moves in front of the fan and hair dryer. Allow students to continue testing one or two materials at a time until they have recorded observations for all the materials. Then ask students to discuss with their partner which materials they may want to use to make their wind measuring tool.

Teacher Note

Plan out how students will take turns using the fan and hair dryer to test materials. For example, provide a set amount of time for students to test each material, and let students know that their turn is over by saying, “1-2-3, that’s enough to see.”

Differentiation

Some students may benefit from referring to the class problem and solution chart as they test the materials. Consider reminding students that they are testing the materials to make a tool that will show them when it is not windy, when it is a little windy, and when it is very windy.

Teacher Note

Students may find many ways to create a successful design. For example, some students may use one material to make their tool while other students may use two or more materials.

Plan a Wind Measuring Tool (5 minutes)

Bring the class back together. Draw a three-column chart on a whiteboard or sheet of chart paper. In the first column of the chart, write the name of each material that students tested and attach a strip of each material next to its name. Then ask students to share what they recorded in their Science Logbooks (Lesson 6 Activity Guide A) about how each material moves when placed in front of the fan and hair dryer. Record this information in the class materials chart.

Sample class chart:

Material	Fan	Hair Dryer
Craft foam		
Felt		
Flagging tape		
Manila envelope		

Teacher Note

Display the class materials chart through Lesson 7 so students can refer to it.

Tissue paper		
Yarn		

Display the class problem and solution chart. Remind students that their tool should show when it is not windy, when it is a little windy, and when it is very windy.

Instruct students to work with their partner from the previous activity to select the materials they would like to use to create their wind measuring tool. Help students store their materials until the next lesson.

Land 7 minutes

Tell students that **engineers** are people who use their science knowledge and creativity to solve problems. Explain that engineers follow a set of steps, called the **engineering design process**, to solve problems.

English Language Development

Introduce the terms *engineer* and *engineering design process* explicitly. Providing the Spanish cognates for *engineer* (*ingeniera*, feminine, and *ingeniero*, masculine) and *engineering design process* (*proceso de diseño de ingeniería*) may be helpful (4A).

Display the engineering design process visual (Lesson 6 Resource B), and have students locate a copy of this visual in their Science Logbooks (Lesson 6 Activity Guide B). Explain that the visual shows the six steps, or stages, of the engineering design process. Tell students that they are following the engineering design

Spotlight on Knowledge and Skills

Lessons 6 and 7 introduce students to the engineering design process to prepare them for the Engineering Challenge in Lessons 12 through 16. In Lesson 6, students define the problem and then imagine and plan a tool that can help them solve the problem. In Lesson 7, students create and improve their tool and share their tool with other students (1.3A).

process to make their wind measuring tools. By the time they are finished, they will have gone through all six stages of the process.

Use the following questions to facilitate an Inside–Outside Circles routine in which students discuss the stages of the engineering design process they engaged in during this lesson. Have students bring their Science Logbooks to refer to during the routine.

Begin by placing a sticky note or magnet next to the Ask stage on the engineering design process visual. Have students point to the Ask circle in their Science Logbooks. Tell students that engineers begin the engineering design process by asking what the problem is and how they might solve it.

▶ When did you ask a lot of questions about the wind?

- *We asked a lot of questions at the beginning of the lesson.*
- *We asked questions when we were trying to figure out how to measure how windy it is.*

Confirm that during the Ask stage, the class determined the problem and decided to create a tool to measure the wind.

Move the sticky note or magnet next to the Imagine stage on the engineering design process visual. Prompt students to point to the circle for this stage in their Science Logbooks.

▶ What do you think engineers do during the Imagine stage of the engineering design process?

- *I think that engineers try to come up with the best way to solve the problem*
- *Engineers probably imagine different ideas.*

Explain that during the Imagine stage, engineers research and brainstorm ideas, just as students did when they explored different materials and tested how the air from the fan and hair dryer made them move.

Finally, move the sticky note or magnet to the Plan stage. Ask students to point to the circle associated with the Plan stage in their Science Logbooks. Explain that during the Plan stage, engineers decide which materials they will use and draw a plan to show how they will use them.

▶ When did you make a plan during today's lesson?

- *We picked the materials that we wanted to use to build our tool.*

Draw students' attention to the class materials chart. Explain that when students used observations from their tests to pick materials for their wind measuring tools, they were in the Plan stage.

Teacher Note

For the Inside–Outside Circles instructional routine, divide the class in half, and instruct students to form two large concentric circles with students in the inside circle facing students in the outside circle. After a question is posed, students discuss their answers with the person they are facing from the other circle. After each question, one or both circles may rotate to provide a new talking partner for subsequent questions. This instructional routine supports metacognition as students hear responses that either support what they are thinking or cause them to reevaluate their own ideas.

Tell students they will explore the other stages of the engineering design process as they continue to work on their wind measuring tools in the next lesson.