

# Lessons 17–20

## Local Weather Data

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### Prepare

In this lesson set, students analyze weather data to answer the Phenomenon Question **What can we find out by looking at weather data?** In Lesson 17, students analyze morning, afternoon, and night temperature data to identify patterns in daily temperature. In Lessons 18 and 19, students use counting and numbers to develop a summary of one month’s weather data, which they will revisit at the end of the school year when they look for long-term weather patterns. In Lesson 20, students learn how meteorologists use tools to collect data and identify patterns that help them predict future weather.

### Student Learning

#### Knowledge Statement

Weather data collected over time may reveal patterns.

#### Objectives

- Lesson 17: Use weather data to identify and describe patterns in daily temperature changes.
- Lesson 18: Summarize monthly temperature data.

### Concept 2: Weather Data

#### Focus Question

What does weather data reveal?

#### Phenomenon Question

What can we find out by looking at weather data?



- Lesson 19: Summarize monthly weather data.
- Lesson 20: Explore how meteorologists predict weather and develop weather forecasts.

## Texas Essential Knowledge and Skills Assessed

- 1.2C **Collect data and make observations** using simple tools. (Addressed)
- 1.2D **Record and organize data using** pictures, **numbers**, and words. (Addressed)
- 1.3B **Make predictions based on observable patterns.** (Introduced)
- 1.3C **Describe what scientists do.** (Addressed)
- 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)
- 1.8C **Identify characteristics of** the seasons of the year and **day and night.** (Introduced)

## English Language Proficiency Standards Addressed

- 3H Narrate, describe, and explain with increasing specificity and detail as more English is acquired.
- 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.
- 4E Read linguistically accommodated content area material with a decreasing need for linguistic accommodations as more English is learned.



## Materials

		Lesson 17	Lesson 18	Lesson 19	Lesson 20
<b>Student</b>	Prepared bag of linking cubes (1 per student pair)		•	•	
	Science Logbook (Lesson 19 Activity Guide)			•	
	Completed weather log for first month of school (1 per student pair)			•	
	Weather forecast (1 per group)				•
<b>Teacher</b>	Times of Day Photographs (Lesson 17 Resource A)	•			
	Daily temperature chart preparation: 3" × 3" construction paper squares in colors corresponding to local temperature data (15), chart paper or whiteboard (1), glue or tape, local temperature data for five consecutive days, marker (1), stickers (5), times of day photographs from Lesson 17 Resource A (1 copy of each photograph, optional)	•			
	Demonstration thermometer from Lesson 5	•	•		
	Photograph of students outside during the first week of school		•		
	Completed weather calendar for first month of school or a photograph of this weather calendar with 3" × 3" construction paper color squares for each day's temperature		•	•	
	Temperature and weather linking cube bag preparation (1 set per student pair): linking cubes (quantity and color will vary with local data), plastic bag (1)		•	•	
	Monthly weather poster: 3" × 3" construction paper square in a color corresponding to the temperature that happened most during the first month of school (1), 11" × 17" or larger paper (1 sheet), marker (1), glue or tape, photograph of students from first week of school (1, optional), photograph of weather calendar for first month of school (1, optional)		•	•	
	Cloud Cover Photographs (Lesson 19 Resource)			•	
	Summarize monthly weather data: completed weather log for first month of school (Lesson 7 Resource B), sheet of paper (1), stickers (2 to 5)			•	

<b>Preparation</b>	Identify three corners or areas of the classroom to use for a Question Corners routine. Prepare a color copy of each photograph in Lesson 17 Resource A. During the lesson, post one photograph in each corner.	•			
	Prepare daily temperature chart. (See Lesson 17 Resource B.)	•			
	<b>1 Month Before:</b> Take a class photograph outside during the first week of school.		•		
	On the weather calendar, identify a 3- to 5-day span during which the temperature remained in the same color band (e.g., five green squares in a row). Cover the rest of the weather calendar before Lesson 18 so that only the selected days are visible.		•		
	Prepare bags of linking cubes for temperature data analysis. For each student pair, prepare 1 bag of cubes that correspond in color and quantity to the temperature squares on the weather calendar for the first month of school.		•		
	Prepare a copy of the completed weather log for the first month of school for each student pair.			•	
	Prepare bags of linking cubes for weather data analysis. For each student pair, prepare 1 bag with enough linking cubes to represent the data on the first month of school’s weather log for each part of weather. Consider using a different color linking cube for each part of weather.			•	
	Identify and cue a video of a local weather forecast from a television broadcast or online resource. If possible, use a video that shows the forecast for the upcoming weekend.				•
	Cue meteorologist video: <a href="http://phdsci.link/1557">http://phdsci.link/1557</a> .				•
	Prepare weather forecasts. (See Lesson 20 Resource.)				•

# Lesson 17

**Objective:** Use weather data to identify and describe patterns in daily temperature changes.

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## Launch 3 minutes

Remind students of the shelter they made for the archaeologists during the Engineering Challenge.

- When do you think the archaeologists would need a shelter most: in the morning, in the afternoon, or at night? Why?
  - *It is usually cooler in the morning, so they might not need it then.*
  - *I think they might need it most in the afternoon because it is hot in the afternoon.*

Highlight student responses that indicate that the temperature is not the same all day. Tell students that during this lesson, they will observe how temperature changes throughout the day.

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## Learn 25 minutes

### Observe Daily Changes in Temperature (7 minutes)

Display the time of day photographs (Lesson 17 Resource A).

### Agenda

Launch (3 minutes)

Learn (25 minutes)

- Observe Daily Changes in Temperature (7 minutes)
- Analyze Daily Temperature Data (18 minutes)

Land (7 minutes)





Explain that the photographs show different times of day: morning, afternoon, and night. Ask students to observe the clothing the people are wearing in each photograph.

Post each photograph in a different corner of the classroom, and label each photograph with the corresponding time of day (morning, afternoon, night). Using a Question Corners routine, ask students to stand near the photograph that shows the time of day when they would be most likely to need a jacket outside.

After students choose a photograph, ask them to discuss with a classmate in the same corner their reasons for selecting that photograph. Then invite students to share their reasoning with the class.

*Sample student responses:*

- *I think I would need a jacket in the morning before it gets sunny.*
- *It is cooler at night, so I always wear a jacket then.*

Next, ask students to stand near the photograph that shows a time of day when they think they would be most likely to need clothes for warmer weather, such as short sleeves or shorts. After students select a photograph, have them discuss their reasoning with a classmate who made the same choice. Then invite students to share their ideas with the class.

*Sample student responses:*

- *Sometimes I wear a sweatshirt to school, but by recess the weather is warmer and I don't need my sweatshirt anymore.*
- *I change into shorts after school because it's warmer in the afternoon than in the morning.*

Bring the class together. Confirm that at different times of day, people might need different clothes to feel comfortable.

► Why might we need to change our clothes throughout the day to feel comfortable?

- *I think the temperature changes. Sometimes I wear a jacket in the morning, but I don't need it in the afternoon.*
- *Sometimes it's raining in the morning but not in the afternoon.*

Highlight student responses that refer to changes in temperature during the day.

► How can we find out about changes in temperature throughout the day?

- *We can go outside and feel what the air is like.*
- *We can use a thermometer or look up the temperature somewhere.*

Confirm that students can look at weather data to find out more about temperature changes. Tell students that **data** are facts, numbers, and other information that people collect and record from their observations or measurements. Add that the information about weather that students record each day is also data.



#### English Language Development

Introduce the term *data* explicitly. Providing the Spanish cognate *datos* may be helpful (4A). Discuss examples of data students may relate to, such as the number of days in the school year or the daily attendance.

Introduce the Phenomenon Question **What can we find out by looking at weather data?** and tell students they will begin answering this question by looking at temperature data from their local area.



## Analyze Daily Temperature Data (18 minutes)

Display the prepared daily temperature chart (Lesson 17 Resource B).

Sample daily temperature chart: 

Day of the Week	Morning	Afternoon	Night
			
Monday	56°	66°	62°
Tuesday	55°	66°	57°
Wednesday	47°	65°	54°
Thursday	41°	55°	53°
Friday	46°	56°	50°

Point out that the chart shows the temperature measured in the morning, in the afternoon, and at night for five days in row. 

▶ What do you notice about the data in the chart? 

- *There are mostly green and yellow squares.*
- *The afternoon has more yellow squares than the morning or night.*

Draw students' attention to the first day on the chart. Use the demonstration thermometer to show students the first day's temperatures for morning, afternoon, and night. Have students act out how the red line in the thermometer changed throughout the day. 

▶ What happened to the temperature during the first day?

- *The temperature went up in the afternoon.*
- *First it was cool in the morning, then it got warm, and then it got cooler again.*



### Teacher Note

The sample weather data in this lesson set are from Weather Underground (<http://phdsci.link/1505>). The sample daily temperature chart shows temperature data for Missoula, Montana, from fall of 2019. Weather data may vary significantly depending on location and time of year. Temperatures are shown in degrees Fahrenheit.



### Teacher Note

The sample questions and responses for this activity are based on a typical temperature pattern of lower temperatures in the morning and at night and higher temperatures in the afternoon. However, certain weather factors (e.g., cloud cover, rain) can disrupt this pattern. If any data are not consistent with the pattern, explain that looking at additional data would reveal that most days show the typical pattern.



### Differentiation

Some students may need support reading the daily temperature chart (4E). Consider distributing math manipulatives—such as linking cubes, beads, or blocks—that correspond in color to the temperatures shown on the chart. Have students stack the manipulatives to model how the temperature changed from morning to afternoon to night for each day on the chart.



### Extension

If students have jackets or sweatshirts with them, consider inviting them to show what they would wear for each time of day. Divide the class into five groups, and assign each group one day from the chart. Have students use their clothing to model for the class what they would wear in the morning, afternoon, and night for their assigned day.

► Which part of the day was the warmest?

- *The afternoon was the warmest.*
- *The afternoon because that's when the red line was the highest.*

Invite a volunteer to place a sticker on the square that has the warmest temperature for that day. Repeat this process for the remaining days on the chart. 

Work with students to help them notice patterns in the temperature data.

► What do you notice about where we placed the stickers?

- *Most of the days have the stickers in the afternoon.*
- *None of the days have stickers in the morning.*

Tell students that they have noticed a pattern in the data. Explain that a pattern is information that repeats and that patterns allow people to predict, or figure out, what will happen.  

Ask students to Think–Pair–Share in response to the following question.

► What patterns do you notice in the data? 

- *It is usually warmer in the afternoon than in the morning or night.*
- *Every day, it is green in the morning.*
- *It starts cool in the morning, then warms up, and then gets cool again at night.*

Invite students to act out how they think the temperature will change throughout the day tomorrow. Use the demonstration thermometer to mirror students' movements by showing the temperature increasing and decreasing.

► What is your reason for thinking that the temperature will go up and then go back down?

- *I think it will get warmer in the afternoon than it was in the morning because that's what happened every day.*
- *I think the weather will change during the day just like it did for the days on the chart.*



### Differentiation

Students who are able to read and compare two-digit numbers greater than 20 may be ready to make observations about numerical temperature readings. Consider challenging these students to identify patterns based on the numbers in the chart (4E).



### English Language Development

Students will encounter the words *pattern* and *predict* throughout the module. Providing the Spanish cognates for *pattern* (*patrón*) and *predict* (*predecir*) may be helpful (4A). Consider providing a familiar example of a pattern, such as a visual pattern or a math pattern. Discuss situations in which students may have made a prediction, such as predicting what they will do at school or predicting what will happen next in a story.



### Spotlight on Knowledge and Skills

In this lesson set, students identify and describe weather patterns. Noticing patterns is often a first step to asking scientific questions about why and how patterns occur. Students look for patterns as they observe similarities and differences in weather over several days, weeks, and months. They apply their emerging counting and cardinality skills as they compare the amounts of objects (e.g., colored squares that represent temperatures) to analyze weather data.



### Teacher Note

If the class developed a What We Notice about Weather poster in Lesson 7, consider adding to it the temperature patterns that students identify.



**Check for Understanding**

Students orally identify a pattern and use this pattern as evidence to act out a prediction of what will happen to the temperature tomorrow.

Evidence	Next Steps
<p>Students observe temperature data and identify a pattern: the temperature is usually higher in the afternoon than it is in the morning or at night. Students then use this pattern as evidence to predict how the temperature will change throughout the day tomorrow.</p>	<p>If students need support identifying patterns in data and making predictions based on those patterns, revisit the daily temperature chart and ask guiding questions such as these:</p> <ul style="list-style-type: none"> <li>• What happened to the temperature every day?</li> <li>• What repeats every day?</li> <li>• Which part of the chart tells you about the warmest part of the day?</li> </ul>

Confirm that students were able to predict what would happen next because of the pattern they noticed. Summarize that the temperature can change throughout the day and that on most days, it is warmer in the afternoon than in the morning or at night. Explain that if students were to look at data from more days, they would find the same pattern. Work with students to record this new understanding on a sentence strip, and add the sentence strip to the anchor chart.

*Sample anchor chart:*

<b>Weather</b>
<p>Parts of Weather</p> <ul style="list-style-type: none"> <li>• Weather has many parts. These parts include sunlight, clouds, wind, rain and snow, and temperature.</li> <li>• The weather in a place is not the same all the time.</li> <li>• Sunlight, wind, and rain can affect the things around us.</li> <li>• We feel cooler in the shade because the sunlight is blocked.</li> </ul>
<p>Weather Data</p>

- The way the temperature changes during the day is a pattern.

► What do you wonder about the temperature pattern that we noticed?

- *Why is it warmer in the afternoon than it is at night?*
- *Is it always warmer in the afternoon, even on cold days?*
- *Are there other temperature patterns?*

Record student questions on individual sticky notes, and add the notes to the driving question board.

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## Land 7 minutes

Revisit the Question Corners activity from earlier in the lesson. Instruct students to move to the photograph that shows the time of day that is most likely to be the warmest. Ask students to use the data on the daily temperature chart to explain their choice as they discuss the following question with a partner and then with the class.

► Why did you choose that picture as the one that shows the warmest time of the day?

- *I moved to the afternoon picture because the afternoon had more yellow temperatures than the other times.*
- *I think that the afternoons are warmest because on the chart, the mornings and nights had more green squares, and the afternoons had more yellow.*

Next, ask students to move to the photograph that shows the time of day when the class measures the outside temperature to complete the daily weather recording sheet. Help students come to an agreement on the time of day when the class usually measures the temperature.

► Why is it important that we measure the temperature at the same time each day?

- *Because the temperature changes during the day.*
- *So that we don't get a different temperature just because of the time of day that we measure it.*

Tell students that if they take measurements at the same time each day, they can look for patterns in temperature data over time.

Return to the clothing discussion from the beginning of the lesson.

- How does knowing that the temperature changes during the day help us decide what to wear?
  - *We might wear a jacket in the morning that we can take off later in the day.*
  - *If we go outside in the afternoon, we might not need to bring a jacket.*

Share that in the next lesson, students will look for patterns in the temperature data that they recorded throughout a month.