

Lessons 4–7

Describing Weather Conditions

Prepare

In Lesson 4, students think about the different ways weather is described as they plan to collect and record weather data each day. Students then prepare to collect weather data by exploring various weather conditions, determining methods for data collection, and recording initial observations and measurements in Lessons 5 and 6. Finally, in Lesson 7, students create and analyze graphs using weather data as they describe stable and changing weather conditions during a single month.

Student Learning

Knowledge Statement

Weather data collected over time reveal stable and changing conditions.

Objectives

- Lesson 4: Build on prior knowledge to describe different types of weather conditions.
- Lesson 5: Make observations to describe wind speed and direction and cloud cover.

Concept 1: Weather Conditions

Focus Question

How do we describe weather?

Phenomenon Question

What is the weather like where we live?

- Lesson 6: Build a rain gauge to measure precipitation and use a thermometer to measure temperature.
- Lesson 7: Graph and analyze data to describe weather conditions throughout a month.

Texas Essential Knowledge and Skills Addressed

- 3.2B **Collect and record data by observing and measuring** using the metric system **and recognize differences between observed and measured data.** (Introduced)
- 3.2C **Construct maps,** graphic organizers, simple tables, **charts,** and **bar graphs using tools** and current technology to organize, examine, and evaluate measured data. (Introduced)
- 3.2D **Analyze and interpret patterns in data to construct reasonable explanations based on evidence** from investigations. (Introduced)
- 3.3C **Connect grade-level appropriate science concepts with** the history of science, **science careers,** and contributions of scientists. (Introduced)
- 3.4 **Record, and analyze information using tools,** including cameras, **computers,** hand lenses, metric rulers, Celsius **thermometers, wind vanes, rain gauges,** pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, magnets, collecting nets, notebooks, and Sun, Earth, and Moon system models; timing devices; and materials to support observation of habitats of organisms such as terrariums and aquariums. (Addressed)
- 3.8A **Observe, measure, record, and compare day-to-day weather changes in different locations at the same time that include air temperature, wind direction, and precipitation.** (Addressed)

English Language Proficiency Standards Addressed

- 2C Learn new language structures, expressions, and basic and academic vocabulary heard during classroom instruction and interactions.
- 3E Share information in cooperative learning interactions.
- 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, Module Question Log)	●			
	Cloud Sort Photographs (1 set per student pair)		●		
	Science Logbook (Lesson 5 Activity Guides A and B)		●		
	Thermometer			●	
	Science Logbook (Lesson 6 Activity Guide)			●	
	Cup of water with ice cubes (1 per student pair)			●	
	Science Logbook (Lesson 7 Activity Guide)				●
Teacher	Blade of grass or small leaf		●		
	Rain Falling in Flower Garden Photograph (Lesson 6 Resource A)			●	
	Build a Rain Gauge: Build a Rain Gauge Instructions (Lesson 6 Resource B), 2-liter plastic bottle with top cut off, 1 cup of pebbles, 2 rubber bands, 3 or 4 paper clips, ruler, sharp scissors, permanent marker, water			●	
	Using the NOAA NCEI Climate at a Glance Website: City Data Information (Lesson 7 Resource A)				●
	Weather Graph Stations: maximum temperature graph, minimum temperature graph, precipitation graph, maximum temperature data table, procedure sheet for each station, red writing utensil				●
Preparation	Prepare Cloud Sort Photographs (see Lesson 5 Resource A).		●		
	Cue wind videos: http://phdsci.link/1165 , http://phdsci.link/1166 , http://phdsci.link/1167 .		●		
	Cut plastic bottle for rain gauge (see Lesson 6 Resource B).			●	
	Prepare cups of ice water.			●	
	Navigate to the NOAA NCEI Climate at a Glance website (2018a): http://phdsci.link/1168 .				●
	Prepare weather graph stations (see Lesson 7 Resources B, C, and D).				●

Lesson 7

Objective: Graph and analyze data to describe weather conditions throughout a month.

Launch 5 minutes



Teacher Note

This Launch assumes that students have collected at least one day of data for everything but precipitation. If students have not yet collected weather data, allow time for students to go outside and collect data before continuing. As students gather weather data, explain that since the rain gauge is being placed today, they will not be able to gather precipitation data until the next day.

Instruct students to look at the first weather data table in their Science Logbooks (Lesson 4 Activity Guide) to observe the weather data they recorded today. Ask students to describe the day's weather conditions using their collected data. Invite several students to share their descriptions.

Sample student responses:

- *The temperature outside was 78°F. It was overcast, but it was not raining. The wind was blowing at a moderate speed and the direction was right in relation to where we were standing in front of the school.*
- *It felt hot outside because the temperature was 84°F. There were only small white clouds in the sky, so it was mostly clear. The wind was very weak because I only saw the leaves of the trees moving a little.*

Agenda

Launch (5 minutes)

Learn (37 minutes)

- Explore Local Weather Data (5 minutes)
- Visit Weather Graph Stations (24 minutes)
- Analyze Graphs (8 minutes)

Land (3 minutes)

► Can we see any patterns in our data that might tell us more about what the weather is like here across the whole month? 

- *Not really, we only have one day of data.*
- *I don't think we can describe patterns in weather data across an entire month because we have only collected data for one day.*
- *No, we don't have enough data.*

Use student responses to agree that more weather data is needed. Explain to students that they will only be able to collect weather data one day at a time, so they will need another way to gather data more quickly. Ask students to think about another way they could gather weather data.

Sample student responses:

- *Maybe we could look at other data that's already been collected.*
- *My dad checks the weather online every day. Maybe we could look online to find more weather data.*
- *Maybe we could look at old weather reports.*

Draw attention to student responses that suggest collecting data from another source such as the internet. Agree to use an additional source to gather more weather data.

Learn 37 minutes

Explore Local Weather Data 5 minutes

Share with students the NOAA NCEI Climate at a Glance website (<http://phdsci.link/1168>) (NOAA NCEI 2018a). Instructions for using this website can be found in Lesson 7 Resource A. Explain to students that this website is operated by a government agency called NOAA, or the National Oceanic and Atmospheric Administration. Tell students that scientists at NOAA collect weather data from across the United States and that these data sets are available for anyone to use. Explain to students that they will use data from this website to learn more about the weather where they live.



English Language Development

The word *pattern* is used repeatedly in this module. Consider sharing the Spanish cognate *patron*, showing a visual pattern as an example, or sharing a student-friendly explanation, such as “A pattern is something that repeats in a predictable way (4A).”



Content Area Connection: English

Encourage students to speak in complete sentences and move beyond yes/no answers by including details or reasons to support their response. Sentence frames such as this one can also be used to support students: “We can/cannot see patterns because _____ (2C).”

Project the website and show students the option to choose a city and state. Work with students to select their state and the city closest to their location.  Once the state and city are identified, click the ID number and scroll down to the section titled Station Data Inventory, Access & History. Then choose the current month and the previous year and select View Data.

Once the web page loads, ask students to closely observe the data table as they Think–Pair–Share about the following question.

► **What do you notice about the data table?**

- *There is a lot of data!*
- *It is hard to read the data in the table.*
- *I can't really tell what any of the data means.*

Draw attention to student responses that describe challenges in reading and understanding the data. Explain to students that scientists often graph data to make the data easier to analyze and understand. Tell students they will use graphs to help focus on the data sets that show maximum temperature, minimum temperature, and amount of precipitation. Explain that the daily minimum temperature is the lowest temperature of the day and that the daily maximum temperature is the highest temperature of the day.

Visit Weather Graph Stations 24 minutes



Teacher Note

Depending on students' familiarity with creating and interpreting bar graphs, the following activity can be extended over two class periods.

Show students the prepared chart paper for the maximum temperature graph. Ask students what they notice about the graph. 

Sample student responses:

- *There are numbers along the left side and the bottom.*
- *The title is daily maximum temperature and it says our city.*
- *The graph says that it is for the month of August last year.*



Teacher Note

The NOAA NCEI Climate at a Glance website does not include weather data for all cities. It is recommended that students choose the city nearest their location. To support students in identifying the nearest city, consider showing students a state map and helping them find the nearest city for which data is available.



English Language Development

English learners may benefit from additional support during the graphing activity. Consider sharing Spanish cognates for terms such as *graph* (*grafico*), *maximum* (*máximo*), *minimum* (*mínimo*), *title* (*título*), and *scale* (*escala*) (4A).



Teacher Note

Continuous data, such as temperature over time, would typically be displayed on a coordinate plane, usually a line graph.

As students make observations about the graph, use sticky notes to annotate the graph with key terminology used to describe the parts of a bar graph, such as *title*, *category*, *scale*, and *label*. If there are key elements of the graph that students do not notice, ask guiding questions to elicit those observations.

Tell students they will use this graph to show the maximum temperature experienced each day across the current month last year. Ask students to identify the labels and the scale.

Sample student responses:

- *The categories along the bottom show each day of the month.*
- *The vertical axis shows the temperature in degrees Fahrenheit.*
- *The scale counts by tens.*

Direct students' attention back to the data table on the NOAA NCEI website and show students the column where maximum temperature data is found. Tell students that to help focus on this data, they will receive a separate data table showing only this information (Lesson 7 Resource C).

Model for students how to graph maximum temperature by identifying a value on the maximum temperature data table, finding the correct day of the month on the horizontal axis of the graph, and then counting by tens on the vertical axis to find the correct temperature. Explain that students will need to estimate if the temperature value is between two numbers on the vertical axis since the scale is in increments of ten.  Once the intersection of the day and temperature are correctly identified, demonstrate how to neatly draw a bar on the graph. If needed, graph two or three additional temperature values. Some students may also benefit from using a ruler to draw vertical lines on the grid to help draw the bars.

Explain to students that they will complete the maximum temperature graph and examine other graphs at the following stations:

- Station 1: Graph maximum temperature
- Station 2: Analyze minimum temperature graph
- Station 3: Analyze precipitation graph



Differentiation

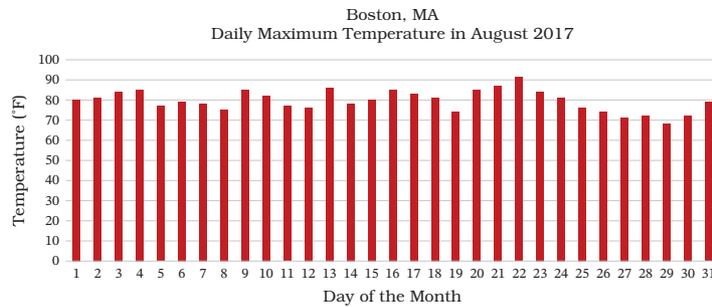
Students may benefit from using a ruler to draw lines or tick marks on the vertical axis to help count to the correct temperature.

Divide the class into three groups and explain that each group will visit three stations.  Students will have about five minutes to complete a task at each station. Describe each task and point out the procedure sheets posted at the stations (Lesson 7 Resource D). Once students are comfortable with the procedure, assign each group to its first station and allow students to begin working.

As students work, circulate to support teamwork and help guide student thinking. Groups at Station 1 may need additional support as they work to complete the class maximum temperature graph. 

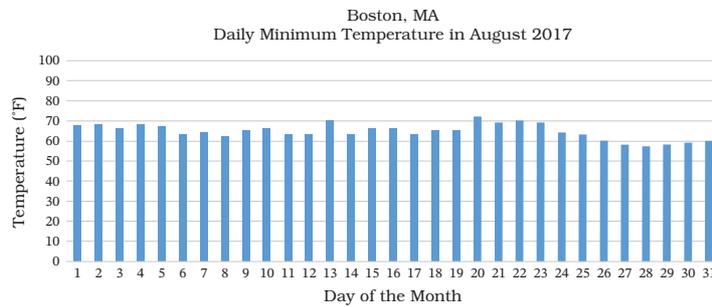
Station 1: Graph maximum temperature

Sample class graph:



Station 2: Analyze minimum temperature graph

Sample prepared graph:



Teacher Note

Depending on the size of the class, the number of stations can be increased to decrease group size. This can be done by creating additional minimum temperature and precipitation graphs for students to analyze. If additional graphs are needed, consider creating the graphs on a computer and printing them out instead of drawing them on chart paper. If printing the graphs, try to print them as large as possible so that students can easily see the data presented.



Teacher Note

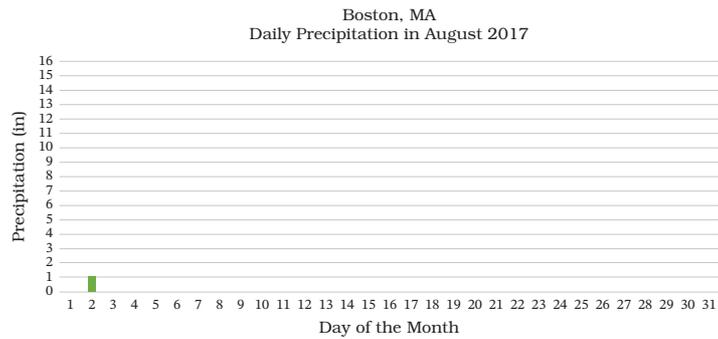
Every student should complete at least one bar on the graph at Station 1. If there are more days in the month than students in the class, ask each student in the group that visits the station last to graph an additional bar to complete the entire month.

Sample student responses (Lesson 7 Activity Guide):

- The minimum temperature is pretty similar each day of the month.
- The lowest temperature is 57°F.
- The highest temperature is 72°F.

Station 3: Analyze precipitation graph

Sample prepared graph:



Sample student responses (Lesson 7 Activity Guide):

- It did not rain much in August.
- It only rained one day the entire month.
- August 2 had the most precipitation.

**Check for Understanding**

Students should show an understanding of how to create a bar graph and how to read data from a bar graph. Students should also start to recognize trends in data.

Evidence

Look for evidence that all students

- can use the simplified data table at Station 1 to determine the temperature on a given day, find the correct day of the month on the horizontal axis, and use the scale on the vertical axis to determine how high to draw the bar on the graph;
- can read the bar graphs at Stations 2 and 3 to report individual values; and
- can summarize general weather conditions throughout the month.

Next Steps

As students visit each station, circulate to help groups and individuals. Pay close attention to the group visiting Station 1 and support students with graphing as needed. If students are having difficulty graphing, consider working with students in small groups to support individual needs. In the next lesson, students will continue to practice their graphing skills independently.

Analyze Graphs 8 minutes

Once the station activity is complete, post the three graphs in an area that is visible to all students. Focus student attention on the maximum temperature graph and ask students to examine the completed graph to describe the maximum temperature experienced throughout the month. Invite students to share their observations. 🌧️

Sample student responses:

- *The maximum temperature kind of goes up and down throughout the month.*
- *The hottest day was around 90°F.*
- *Most days were pretty warm.*

Next, draw student attention to the minimum temperature and precipitation graphs. Ask students to discuss the observations they recorded about these graphs in their Science Logbooks (Lesson 7 Activity Guide) with a partner. After a few minutes, invite student pairs to share their observations with the class.

**Content Area Connection:
Mathematics**

While analyzing graphs, remind students that mathematicians think about numbers in many ways to make sense of quantities and their relationships to real-world situations. When students describe data, make sure they always use a unit when describing quantity. For example, when describing precipitation, students should always give a unit along with the number (e.g., 1 inch). Consider asking questions such as the following to support students in describing data.

- What do the numbers in the graph represent?
- How are the numbers on the vertical axis different from the numbers on the horizontal axis?
- How are the numbers in the graph related to weather?

Sample student responses:

- *The minimum temperature didn't change that much during the month.*
- *It only rained one day during the entire month.*
- *Even the lowest temperatures throughout the month were not very cold.*

Explain to students that the information shown on these graphs can be combined to describe the general weather conditions experienced throughout the month last year. Ask students to use evidence from the graphs to describe the general weather conditions experienced throughout the month.

Sample student responses:

- *In August 2017, the temperature was mostly warm with very little precipitation.*
- *In August 2017, the temperature was mostly warm. The hottest maximum temperature was 91°F and the coldest minimum temperature was 57°F. It only rained one day during the whole month.*

If students describe any conditions as not changing much throughout the month, explain that these conditions are mostly stable, or unchanging. Contrast this to any conditions that do show variability throughout the month to help students understand the meaning of the word *stable*. 

Remind students of the NOAA NCEI data table they observed at the beginning of the lesson. Ask students to share what they were able to notice more easily once they graphed the data.

Sample student responses:

- *It was easy to see what days had precipitation.*
- *It was a lot easier to compare the temperatures across the whole month.*

Use student responses to agree that using graphs can make analyzing data much easier.



English Language Development

The word *stable* is used repeatedly in this module. Consider sharing the Spanish cognate *stable* (4A).

Land

3 minutes

Ask students whether they are now able to answer the Phenomenon Question **What is the weather like where we live?**

Sample student responses:

- *We know what the weather is like in August, but we don't know about the rest of the year.*
- *We only know what the weather is like in August.*

Highlight student responses related to needing data for other months of the year. Ask students to consider what a graph from another month of the year might look like.

Sample student responses:

- *I think the temperatures would be different if we graphed data from December or January.*
- *It seems like it rains a lot during April. I wonder if there would be more precipitation during that month.*
- *I think July data might look similar to August data since those are around the same time of year.*

Use student responses to explain that looking at more data may help further explain what the weather is like where they live. Agree to explore what the weather is like during other months of the year in the next lesson.

