

## K-ESS2 Earth's Systems

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Students who demonstrate understanding can:

**K-ESS2-a. Observe, record, and share representations of local weather conditions to describe changes over time and identify patterns.** [Clarification Statement: Representations may include pictograms, charts, tallies, and drawings. Time can vary from hours to seasons. Scientists look for patterns in their observations. An example of a pattern is that it is usually cooler in the morning than in the afternoon.] [Assessment Boundary: Recording of observations should be limited to qualitative observations.]

**K-ESS2-b. Obtain information from text and other media about different types of local weather, including severe weather, and identify the most common types of weather in the local region.** [Clarification Statement: Looking for the most common type of weather is looking for a pattern in the recorded data. Scientists use data from others' observations to look for patterns in what has occurred in the past.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

#### Science and Engineering Practices

##### Analyzing and Interpreting Data

Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use and share pictures, drawings, and/or writings of observations. (K-ESS2-a)
- Use observations to describe patterns and/or relationships in the natural and designed worlds in order to answer scientific questions and solve problems. (K-ESS2-a)

##### Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information.

- Read and comprehend grade-appropriate texts and media to acquire scientific and/or technical information. (K-ESS2-b)

#### Connections to Nature of Science

##### Science Knowledge is Based on Empirical Evidence

- Scientists look for patterns and order when making observations about the world. (K-ESS2-a),(K-ESS2-b)

*Connections to other DCIs in this grade-level: will be added in future version.*

*Articulation of DCIs across grade-levels: will be added in future version.*

*Common Core State Standards Connections:*

*ELA/Literacy –*

**RI.K.3** With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text. (K-ESS2-b)

**RI.K.10** Actively engage in group reading activities with purpose and understanding. (K-ESS2-b)

**W.K.2** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2-a)

**W.K.7** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-b)

**SL.K.5** Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS2-a)

*Mathematics –*

**K.CC.4** Understand the relationship between numbers and quantities; connect counting to cardinality. (K-ESS2-a)

**K.MD.1** Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-a)

**K.MD.2** Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-ESS2-a)

**K.MD.3** Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-a)

#### Disciplinary Core Ideas

##### ESS2.D: Weather and Climate

- 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. (K-ESS2-a),(K-ESS2-b),(secondary to K-PS3-a)

#### Crosscutting Concepts

##### Patterns

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-a),(K-ESS2-b)

\*The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice, Disciplinary Core Idea, or Crosscutting Concept.



## LESSON 2

# Observing the Weather

### Overview and Objectives

Now that students' attention is focused on observing the weather, Lesson 2 helps them discover how they can use their senses of sight, hearing, smell, and touch to find out more about the weather. After reading about a National Weather Service meteorologist, students relate their observations to the way scientists observe weather. These experiences prepare them for Lesson 3, when they begin to record weather data on a daily basis, just as meteorologists do.

- Students use their senses to observe the weather.
- Students discuss and record data about observable weather features.
- Students brainstorm questions they have about weather.
- Students read about and discuss how meteorologists study the weather.

### Background

**Weather** can be defined as the "state of the atmosphere with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness" (*Webster's Tenth New Collegiate Dictionary*). Changes in the weather are the result of changes in the **atmosphere**, which is the blanket of air that surrounds the earth. The sun fuels these changes. It heats up the air, causing variations in temperature; these variations create movement in the air, making winds blow. The sun also draws moisture from the earth's oceans and rivers, from which clouds and precipitation develop.

In this unit students observe and record the weather variables of cloud cover, precipitation, wind, and temperature. Meteorologists at the National Weather Service use these variables and several others to make their forecasts. (Your class will learn more about meteorologists and the work they do from the reading selection "Observing the Weather with a Meteorologist," on pg. 26.)

In Lesson 2, your students may still confuse signs of weather with observations of nature, seasons, and holidays. For example, they may think of the Fourth of July as "hot weather," or may say that they hear crickets or smell flowers as they describe their observations. It is not necessary to correct such observations at this early stage. As the unit progresses, you will notice the growth in their ability to make these distinctions.

**Note:** You will see that Record Sheet 2-A: Weather Observations is included in the Materials list in this lesson. Your class may be using the Student Notebook, *My Weather Book*, which contains all the record sheets and student instructions for the unit. If not, you will need to make copies of these sheets, which are found at the end of the lessons in which they appear.)



## Materials

For each student

- 1 copy of **Record Sheet 2-A: Weather Observations**

For the class





- 1 copy of the blackline master **The Four Senses**
  - 2 sheets of newsprint
  - 1 overhead transparency of Record Sheet 2-A (optional)
- Transparent tape

## Preparation

1. On one sheet of newsprint, write the title "Weather Observations." Make one copy of the blackline master **The Four Senses**, on pg. 31. Cut out the pictures and tape them to the sheet of newsprint to create a class chart like the one shown in Figure 2-1.
2. On the other sheet of newsprint make a chart entitled "Questions We Have about Weather."

**Figure 2-1**

Chart ready for  
class use

Weather Observations	
 seeing	
 hearing	
 touching	
 smelling	

3. Make one copy for each student of **Record Sheet 2-A: Weather Observations**, on pg. 30. You may want to make an overhead transparency of this record sheet to use for recording students' observations as a class instead of having students record their observations individually.
4. Identify a location outside where you can take the students to see the sky and observe the wind moving through plants and trees. Plan to take the class outside when other students are not using the playground.

## Procedure

1. Ask students to identify each of their senses and discuss the kind of information they get from each one.

### Safety Tip

Inform students that the sense of taste is not used in science class but that the other four senses can be used to observe.

2. Use the following poem, "Who Has Seen the Wind?" by Christina Rossetti, to introduce a discussion about how we take in weather information through our senses.

### Who Has Seen the Wind?

Who has seen the wind?  
Neither I nor you:  
But when the leaves hang trembling,  
The wind is passing through.  
Who has seen the wind?  
Neither you nor I:  
But when the leaves bow down their heads,  
The wind is passing by.

Reprinted, with permission, from *Random House Book of Poetry for Children* (New York: Random House, 1983), pg. 27.

3. Now take the students outside to have them observe the weather using their senses (e.g., looking up and observing the sky; noticing whether their skin feels hot, warm, or cold; listening to the wind; or smelling the rain).





### Safety Tip

Tell students not to look directly into the sun because it can be harmful to their eyes. Also, if you plan to have your students outside for 20 minutes or more, you might want to have them wear protective sunscreen and hats.

4. When you return to the classroom, distribute one copy of **Record Sheet 2-A: Weather Observations** to each student. Ask them to draw pictures of something they noticed about the weather or to write about what they observed while they were outside.
5. Ask students to share their observations with the class. Record these observations on the class chart, "Weather Observations." Figure 2-2 illustrates some student responses.

Figure 2-2

Student  
observations  
recorded on  
the chart

Weather Observations	
 seeing	sun - bright clear - crisp light trees sky blue. white clouds. blowing and hats. plants waving
 hearing	birds wind grasshoppers breeze blowing wind echo seeds rattling
 touching	wind - feel trees leaves feel the heat - Sun.
 smelling	air rainy streets plants roses bad!

6. Help students name the various weather features that they observed, such as rain, snow, sunshine, clouds, or wind. Encourage the class to discuss their observations by asking which sense they used most frequently. Ask students whether they used more than one sense to observe the same weather feature—for example, feeling, hearing, and seeing rain.
7. Leave the class chart “Weather Observations” out where students can see it as the unit progresses. Students may want to add more observations later.

### Final Activities

1. Invite students to brainstorm questions they have about the weather. Record their questions on the “Questions We Have about Weather” chart.
2. Let students know that a meteorologist is a person who can answer many questions about weather. To introduce them to the work that meteorologists do, read “**Observing the Weather with a Meteorologist,**” on pg. 26. Tell your students that Barbara McNaught is a real meteorologist whose office is at the National Weather Service in Sterling, Virginia; she was interviewed for this reading selection.



Figure 2-3

Using senses to  
observe the  
weather



3. After reading "Observing the Weather with a Meteorologist," have students discuss some of the following questions:
    - How does Barbara McNaught use her senses to observe the weather?
    - What is another way a meteorologist finds out about weather?
    - What senses might tell you that a thunderstorm is on the way?
  4. Ask students if the story about Barbara McNaught answered any of their questions about weather. Record any additional questions they may have on the chart. Keep this chart in a place where students can add to it when they have more questions.
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1. Invite a meteorologist to visit your class. Have students ask the meteorologist to discuss the questions they recorded in this lesson.
  2. For a take-home activity, have students fill out **Record Sheet 2-A** on rainy, snowy, or windy days. You could also send home with students a copy of "Observing the Weather with a Meteorologist" to share with their families.
  3. Read a book about stormy weather, such as *City Storms*, by Mary Jessie Parker. Then have students use watercolors to paint pictures of storms and have them dictate a sentence or two about their pictures. These illustrations can make a colorful bulletin board or class book.
  4. To reinforce the idea of observing the weather, read books such as *Rain Talk*, by Mary Serfozo, or *Listen to the Rain*, by Bill Martin and John Archambault.
  5. Discuss safety tips for types of severe weather, such as tornadoes or hurricanes, that might occur in your area. You can contact the National Weather Service, the American Red Cross, the Federal Emergency Management Agency, or your state or local emergency services office for more information about disaster safety.

### Extensions

SCIENCE

SCIENCE

LANGUAGE ARTS

ART

LANGUAGE ARTS

SCIENCE

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## LESSON 3

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# Recording the Weather

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### Overview and Objectives

Students began observing and describing the weather in the first two lessons. To improve their ability to observe the weather, they now focus on two basic weather features: cloud cover and precipitation. Recording observations on a daily Weather Calendar introduces students to long-term data collection. At the end of the unit, students will summarize the weather data they have collected.

- Students observe and discuss cloud cover and precipitation.
- Students collect data about cloud cover and precipitation.
- Students record weather data on a calendar.

### Background

In the *Weather* unit, students observe and measure four variables that meteorologists work with—cloud cover, precipitation, wind, and temperature. They have many opportunities to observe these variables and to record and interpret their weather data, first gathering information with their senses and later on using simple weather instruments.

In Lesson 3, students are introduced to the Weather Calendar, on which they will record their weather data for the rest of the unit. The Weather Calendar provides a simple and understandable way for children to participate in long-term data collection and analysis, much as scientists do.

At the end of the unit, students will use the data they collect in order to summarize their observations of the weather. At that time, for example, they may discover that during the weeks they recorded the daily weather, it was mostly cold and rainy, or that it stayed quite hot and dry, or that it varied considerably.

### Materials

*For the class*

- 3 Weather Calendars
- 1 set of 11 weather stamps
- 1 date stamp
- 1 stamp pad
- 100 Post-it™ notes, 7.6 x 12.5 cm (3 x 5 in)



## Preparation

1. Write the name of the current month and the year in the blank space at the top of one of the Weather Calendars. Use the other two calendars as needed for the rest of the unit.
2. Choose a place in the classroom to display the Weather Calendar. Select a spot where there is enough space for the class to gather around the calendar to discuss daily weather observations.
3. Decide on a system for having individual students take turns observing and recording the weather for the class during the rest of the unit. Various possibilities are suggested in the box below.

### Recording the Weather Daily

You can integrate the Weather Calendar into your daily calendar activities. For example, you may already be reviewing days of the week and dates by using sentences such as these: "Today is [Wednesday, October 24th]. Yesterday was [Tuesday, October 23rd]. Tomorrow will be [Thursday, October 25th]." This would be a natural time to talk about today's, yesterday's, and tomorrow's weather.

You will need to select an effective system for assigning students to observe and record the weather on a daily basis. Here are some possibilities:

- Appoint a team of two or more students for each week. Have one student collect the data and another record these observations for the class on the Weather Calendar.
- Assign a different student each day to observe and use the weather stamps to record the observations of the day's weather.
- Ask the children as a class or in small groups to describe the weather, and then select one student to record the day's weather.
- Assign one student to observe and record the weather over weekends and holidays. You would need to make two copies of the weather stamps (Figure 3-1) to send home with the student, who would circle the stamps illustrating the weather.

So that students will be able to summarize their data at the end of the unit, try to have them observe the weather at the same time each day and perhaps put the time of day the observations were made on each day's Post-it™ note. In some areas, and especially during some seasons, the weather will change during the day. If this happens during the time your class is keeping its Weather Calendar, you might want to have the students observe and record the weather twice during the same day.

## Procedure

1. Ask the question "What was the weather like two weeks ago?" Students probably will not remember exactly what it was like unless something dramatic like a major snowstorm happened. Ask students to describe today's weather. Finally, ask them to discuss how they might be able to remember today's weather two weeks from now.
2. Introduce the Weather Calendar as one way to keep track of the daily weather. Show students the weather stamps, the date stamp, and the Post-it™ notes. Starting today, they will observe the weather and record

their observations using the weather stamps on a Post-it™ note, which will then be attached to the Weather Calendar. (The system that you have selected for making these assignments can be explained to the class later; see **Final Activities**, Step 4, on pg. 36).

3. Discuss the 11 weather stamps, pictured in Figure 3-1, in more detail with the class. As you show them the stamps, let them know that they will use the wind stamps in the next lesson. The three groups of stamps are
  - Cloud cover (sunny, partly cloudy, cloudy, foggy)
  - Precipitation (no precipitation, snow, hail, rain)
  - Wind (no wind, some wind, strong wind)
4. Now take your class outside to observe today's weather. Ask students to pay attention to cloud cover and precipitation.

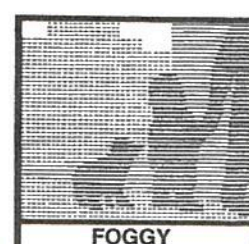
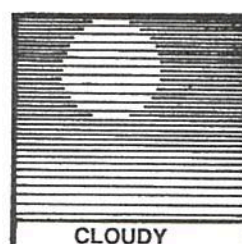
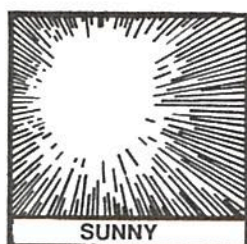
## Final Activities

1. When you return to the classroom, ask students to decide which stamp best illustrates the cloud cover today. Select one student to use that stamp on a Post-it™ note.

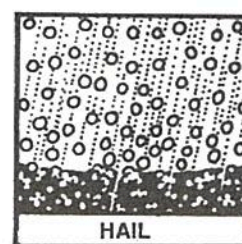
**Figure 3-1**

*The 11 weather stamps*

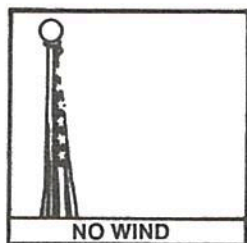
### CLOUD COVER



### PRECIPITATION



### WIND

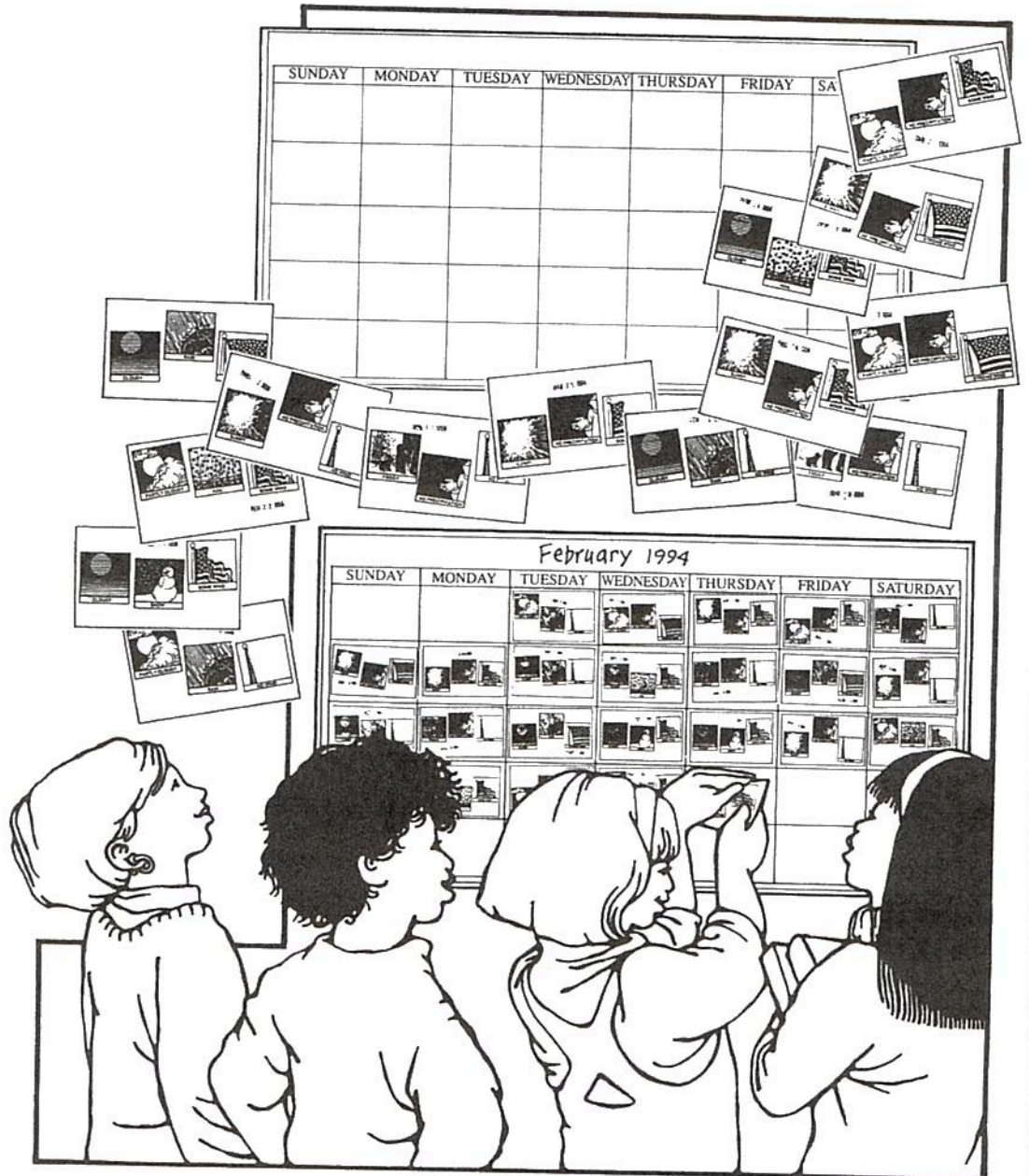




2. Ask the class to decide which stamp best illustrates today's precipitation and have one student stamp the same Post-it™ note with that stamp.
3. Finally, show the class the date stamp, and choose one student to stamp the date on the Post-it™ note. Then stick the Post-it™ note to the Weather Calendar. Figure 3-2 shows how a partially completed Weather Calendar looks as students record data.
4. End the lesson by explaining to students the system you have devised (see **"Recording the Weather Daily,"** on pg. 34) so that each student will have a turn observing and recording the weather for the class.

**Figure 3-2**

*Recording data  
on the Weather  
Calendar*



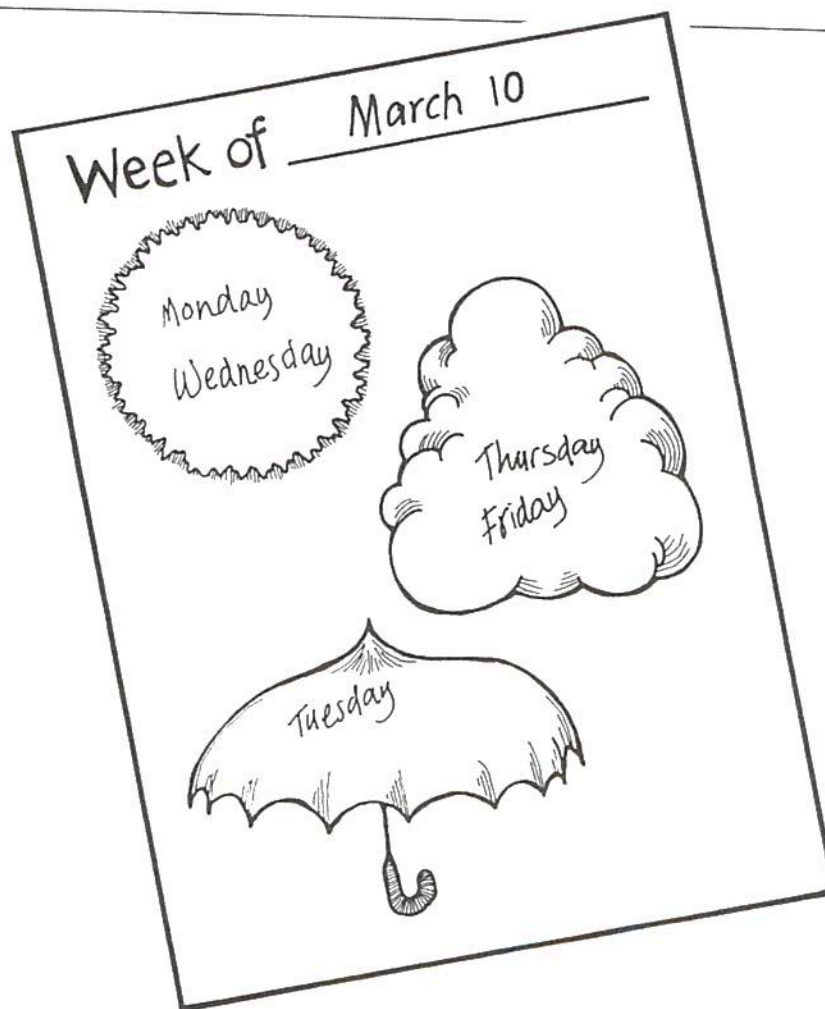
## Extensions

## SCIENCE

1. Diagrams are a good way to help students summarize the weather. Figure 3-3 illustrates one way to make a lively diagram. To fill it in, have students refer to the Weather Calendar at the end of the week to see what the weather was like each day. Students would then record the sunny days inside the sun, the rainy days in the umbrella, and the cloudy days in the cloud. You could add to or modify this type of diagram as needed to match the weather in your geographic area.

Figure 3-3

Summarizing  
weather data on  
a diagram



## SCIENCE

## ART

2. Set up a learning center where students can use the weather stamps. Have students make a sample of all 11 stamps on a sheet of paper to show and discuss with their families. This helps introduce their families to the topic that your students will be studying for the next few weeks.
3. Have students make large stuffed clouds, raindrops, or suns to hang around the room. They can also use the stuffed objects to create a mobile. Children can easily make these objects by cutting out two pre-drawn patterns of each weather element and gluing them together at the edges, leaving an opening for stuffing them with cotton or paper.



**Assessment***Observational Guidelines*

In this lesson students started recording daily observations on the Weather Calendar. To help them learn how to analyze their data, ask questions that encourage them to make comparisons and synthesize information. Throughout the rest of the unit, notice changes in your students' recording and analyzing skills.

Following are some questions that you might ask your students:

- How many days this week were sunny?
- How many days this week were cloudy?
- Were there more sunny or rainy days last week?
- What was special about the weather on [select a day of the week]?
- Which days this week had similar weather?
- On which day did you most enjoy the weather? Why?

**Note:** The weather will not necessarily accommodate teaching the lessons in this unit in sequence. If necessary, the following lessons can be postponed and taught later in the unit when the weather is suitable:

- Lesson 4: Estimating Wind Speed
- Lesson 9: Experimenting with Color and Temperature
- Lesson 10: Making a Rain Gauge
- Lesson 11: Exploring Puddles
- Lesson 13: Observing Clouds

## LESSON 16

# Summarizing Our Weather Observations

### Overview and Objectives

In this lesson, students' discussion of weather features they have observed over the course of the unit provides you with an opportunity to assess the growth in their knowledge of weather. Early in the unit, students were asked how one might remember what the weather was like two weeks before. Today they realize that they now have the information they need to answer this question. By examining the data from the Weather Calendar and Temperature Graph, they are able to summarize the weather over the past few weeks.

- Students review and discuss the data from the Weather Calendar and the Temperature Graph.
- Students tally collected weather data.
- Using their data, students summarize characteristics of the weather over a long period of time.

### Background

One of the goals of the *Weather* unit is to help students collect, record, and interpret information. The activities in this lesson provide an opportunity for them to take part in interpreting the data that the class has been collecting over a long period of time. They will use the data on the Weather Calendar to form generalizations about what the weather has been like while they have been working on the unit.

The data might show, for example, that there were 30 sunny days, 4 partly cloudy days, and 6 cloudy days during that time. Using those numbers, students might formulate a statement like this: During our study of weather, most days were sunny. (It is important to remind the class that their conclusions reflect only the local weather for the period of time that their data were collected.)

In this lesson, students also examine the Temperature Graph. The graph may, over time, show a gradual change in temperature as the season changes. Sometimes, however, unexpected weather changes overshadow usual seasonal variations. If that happened while your class was studying the Weather unit, students can discuss and identify when variations occurred.

### Materials

*For each student*

- 1 copy of **Record Sheet 16-A: Student Weather Tally**
- 1 copy of the blackline master **Super Meteorologist Award**
- Several completed Weather Calendar Post-it™ notes



*For the class*

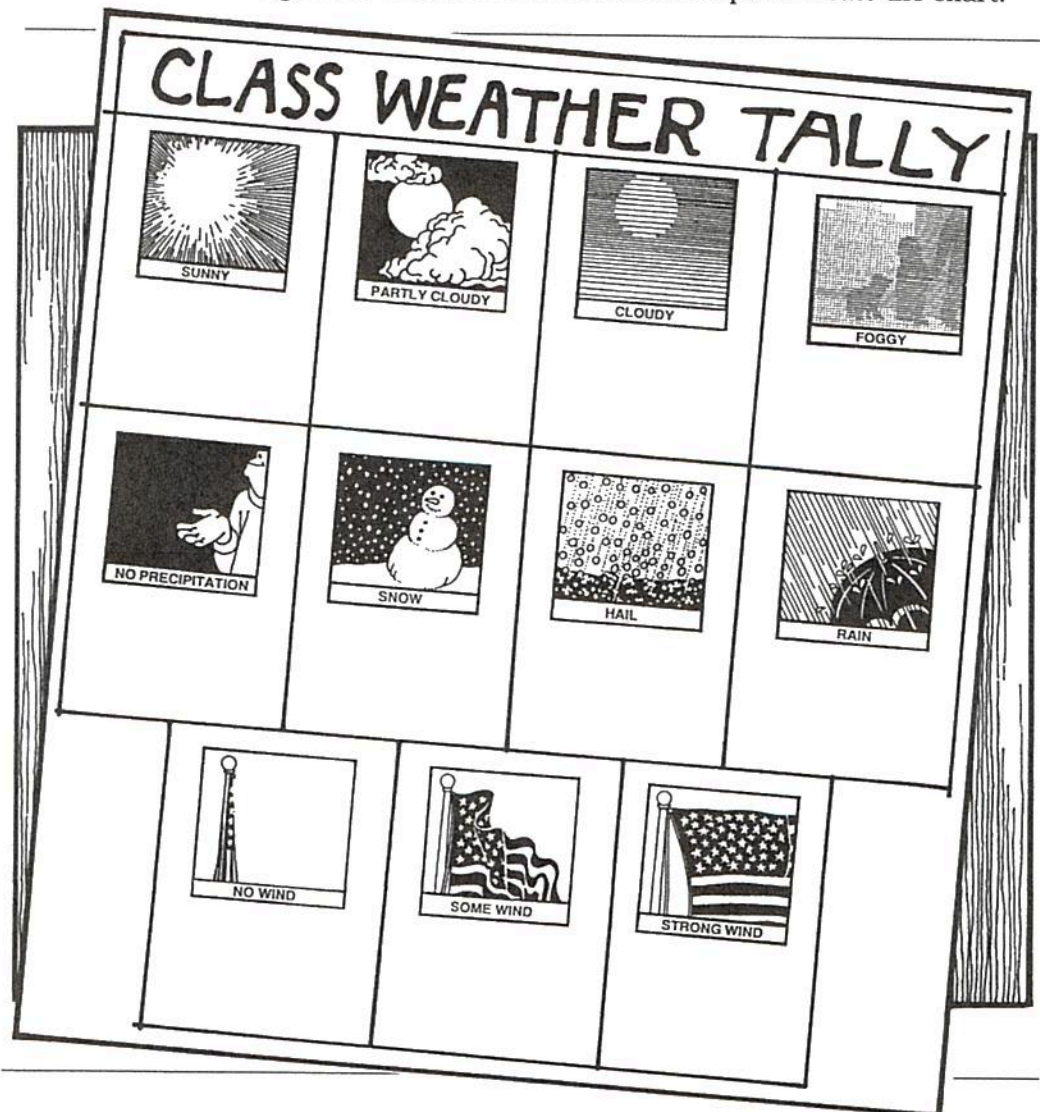
- 1 sheet of newsprint
- 1 set of 11 weather stamps
- 1 marker
- Weather Calendar
- Temperature Graph
- "Questions We Have about Weather" chart, from Lesson 2

**Preparation**

1. Make a copy of **Record Sheet 16-A: Student Weather Tally**, on pg. 155, for each student.
2. Make one copy of the blackline master **Super Meteorologist Award**, on pg. 156, for each student and fill it out. Decide how you want to present the awards to the students. (See Extension 1, on pg. 153, for ways to celebrate students' completion of the unit.)
3. Plan to distribute an equal number of Post-it™ notes from the Weather Calendar to each student. Figure out how many notes each will receive.
4. On the sheet of newsprint, make a chart with the title "Class Weather Tally," as shown in Figure 16-1. Use the 11 weather stamps to create the chart.

**Figure 16-1**

A weather  
tally chart



## Procedure

1. Ask students what the weather was like two weeks ago. Invite one student to use the data recorded on the Weather Calendar to describe the weather at that time.
2. Show students the "Class Weather Tally" chart, and let them know that they will receive a record sheet that looks like this chart. They will use these record sheets to summarize the weather that was recorded on the Post-it™ notes from the Weather Calendar.
3. Using the "Class Weather Tally" chart, demonstrate to students how they will record the data from the Weather Calendar on their record sheets:
  - Choose a Post-it™ note from the Weather Calendar.
  - Read the weather data recorded on the note aloud to the class.
  - As you read, make a tally mark for cloud cover, precipitation, and wind in the appropriate space on the chart, as shown in Figure 16-2.

**Figure 16-2**

*Tallying the  
weather data*

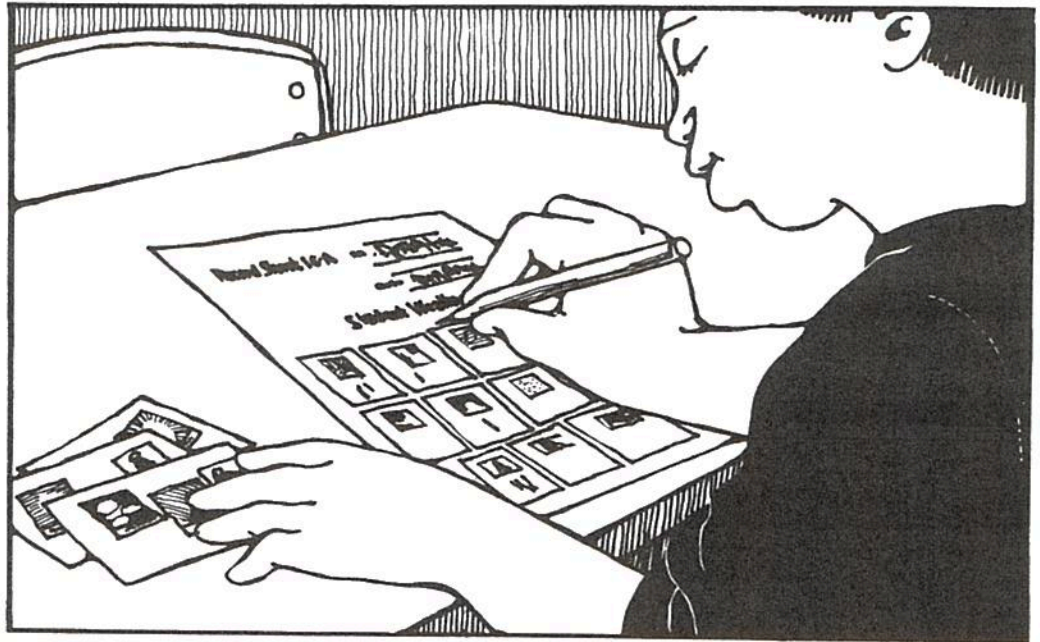


4. Distribute a copy of **Record Sheet 16-A: Student Weather Tally** to each student. Also distribute the Post-it™ notes from the Weather Calendar to the students and have them record the data on their record sheets (see Figure 16-3).
5. Once students have completed their record sheets, help them compile all of the information on the "Class Weather Tally" chart. Call on each student to tell you how many tallies he or she marked in each section for cloud cover, precipitation, and wind.
6. Count the total number of tallies in each section of the class chart and record this number in the respective sections.



**Figure 16-3**

*Filling out the  
record sheet*



7. To help students summarize the data from the "Class Weather Tally" chart, discuss the following questions:
  - How many days were sunny?
  - Which type of cloud cover was most common?
  - Which type of cloud cover was least common?
  - What kind of precipitation was most common?
  - Were there any types of precipitation that did not occur at all?
  - How often was there no wind at all?
  - How often was there some wind or strong wind?
8. Now look at the Temperature Graph and discuss which temperatures were the most and least common. Highlight any temperatures that were unusually high or low.

### Final Activities

1. To synthesize all of these data, have students help you write summary statements. For example, "The weather during the *Weather* unit was mostly cloudy with a lot of rainy days, and it was cold. There were only a few days of sunshine, and there was not much wind."
2. Invite students to look at the list of questions about weather they generated in Lesson 2 and added to during the unit. Which questions have been answered? Which questions have not been answered? Are there any they want to add today? Encourage students to continue learning about weather by investigating these questions.
3. Hand out the **Super Meteorologist Awards** to the students and celebrate their work as meteorologists! See Extension 1 for celebration ideas.