

Introduction

Students initially work together in teams of two or three to interpret a weather map and construct a weather report. Each team then combines with another team to collaborate, prepare, and present a weather report to the class. Students use the information presented by their classmates to forecast the next day's weather.

Key Concepts and Process Skills

(with correlation to the National Science Education 5–8 Content Standards)

1. Global patterns of atmospheric movement influence local weather. *(Earth Science Standard A: Structure of the Earth System)*
2. Weather is the outdoor conditions (such as temperature, precipitation, cloud cover, etc.) at a particular time and place. Weather maps provide visual summaries of some of these conditions. *(Earth Science Standard B: History of the Earth)*
3. Scientists such as meteorologists, atmospheric scientists, climatologists, and hydrologists study different aspects of the earth's weather and atmosphere. Society relies on the information provided by such scientists. *(History of Science Standard A: Science as a Human Endeavor)*

Advance Preparation

If possible, gather local weather maps from daily newspapers or maps from weather websites. Analysis Question 2 asks students to construct a key and draw weather symbols on a map of Iowa based on weather conditions shown on the map. If possible, provide colored pencils (green, red, and blue) for students to use with this question.

Background Information

Weather maps show the weather at the time when the map is created. Today they are made by combining a radar image showing clouds, wind patterns and precipitation with a map showing weather fronts and areas of high and low air pressure at the Earth's surface. There is always a key to explain the various graphic icons used to represent the different weather features and conditions.

Weather maps are often used to create a weather forecast. The method of forecasting varies depending on a meteorologist's experience, how much information is available, how difficult the forecast is, and how much accuracy is needed. Although there are several different methods of weather forecasting, a common method called the trends method is modeled in this activity. For this method, the meteorologist uses information such as the movement of fronts, pressure centers, clouds, and precipitation to predict where these features will be at a future time. For example, if a storm system is 500 miles west of a location and moving to the east at 250 miles per day, the prediction would be for it to arrive in 2 days.

Teaching Suggestions

1. Explain how weather maps are compiled from satellite data.

Display Transparency: Satellite Image of Clouds over North America. Explain as much of the following to your students as you think appropriate: This image is produced by applying false color to satellite data. A certain amount of radiation is reflected from clouds, and satellites measure this radiation using an instrument called a radiometer. Clouds that are closer to the earth's surface tend to have warmer temperatures and reflect more radiation. On the transparency, these clouds can be seen as

areas of white/gray. Clouds higher in the atmosphere are colder and reflect less radiation. On the transparency, these clouds appear as areas of yellow and blue. The map of North America has been placed into the satellite image for data interpretation purposes. From such satellite images, meteorologists can determine cloud height, thickness, and temperature. They combine this information with air pressure and temperature data from weather stations and radar images to construct a weather map using symbols to represent areas of precipitation, fronts, and even severe weather events, such as tornadoes and hurricanes.

Distribute a copy of the Student Worksheet and Guide to each student and have them read the introductory paragraph and Challenge. Briefly respond to any questions.

2. Students summarize a weather map and write a weather report.

The kit contains 16 cards, each containing two U.S. Weather Maps from August 24 through August 31. The activity is designed so that two teams within the class will initially work on the same day's map (Procedure Steps 2–4), and then later get together to share and compare their interpretations (Procedure Step 5). Take this into account when you are assigning days to each team. Depending on your class size and your students, you could assign some, or all, of your students to initially work individually on their own map. Make sure each team knows which day they are assigned to analyze and report on, and then distribute the appropriate Weather Map Card to each team.

Complete Procedure Step 1 as a class by reviewing the weather symbols. Emphasize that some of these symbols can vary with different media sources, such as newspapers, television stations, or web sites and that it is very important for every weather map to include a key so the symbols can be correctly interpreted.

Encourage teams to complete Procedure Steps 2–4. Circulate among the teams, providing assistance where needed as each team writes a weather report summarizing and explaining the weather seen on the weather map for their assigned day. Encourage students to write in the present tense, as if they were reporting on TV or radio.

After students have completed their initial reports, move on to Step 5 and have teams that were assigned the same date collaborate to produce a “final” report. The two teams should review and compare their maps to check that they have included information about all major weather elements shown in the map. Then the two teams should prepare one report to present to the class. A sample weather report is shown below.

Sample Weather Report for August 24th

Today is August 24, and here are the current weather conditions. There is a cold front stretching from northern Arizona up through northern Minnesota. This cold front is causing cooler temperatures in northern Arizona, and parts of northern Colorado, Nebraska, South Dakota, and Minnesota. In northern Washington, Idaho and Montana, it is raining, so take your raincoats and umbrellas to work. Parts of Texas are experiencing rain, with some clearing because of a high pressure system. In Florida, it is raining, with heavy rains along the coast due to the hurricane that formed over the weekend. There are clear skies over West Virginia because of a high pressure system. A cold front is stretching from Michigan up into Canada causing colder temperatures.

3. Students present weather reports to the class and evaluate summaries of the week's weather.

Procedure Step 7 contains a set of questions to help students summarize the weather reports from their classmates. Students should read the statements before they listen to the weather reports. As the reports are presented in chronological order, students can take notes or jot down information and then complete the T-F statements when all of the reports are finished.

Key

T 1. *There was precipitation of some form somewhere in the U.S. every day from August 24 to 31.*
Each map contains areas (of green), which represent precipitation.

F 2. *A hurricane reached the state of Texas.*
The hurricane did not reach Texas.

T 3. *Weather moves from west to east across the U.S.*
This pattern can be documented by comparing the position of the cold front stretching across the middle of the United States on August 24 to its subsequent position on August 25 through August 31 as it moves from west to east.

Note: This same pattern can be observed by comparing the position of some of the pressure systems and fronts, but it is not always apparent with precipitation, since areas of precipitation can dissipate and arise and do not span the entire United States from west to east.

F 4. *Areas of low pressure can only be found along the coasts.*
Areas of low pressure can occur anywhere in the United States.

F 5. *Any tornadoes that occurred were located in states on the west coast of the U.S.A.*
On August 27, there was a tornado warning in the central United States.

4. Students forecast the weather for September 1.

In Procedure Step 8, students use the weather reports to forecast the weather on September 1 for Cleveland, Ohio. To help them do this, there are copies of all eight of the weather maps at the end of the Student Worksheet and Guide. While they should think about all of the weather patterns they heard about, they should particularly look at the weather that is to the west of Cleveland on August 31. A sample student forecast is provided below.

Sample Student Weather Forecast for Cleveland, Ohio for September 1

For September 1, weather in Cleveland will be rainy as a cold front and low pressure system move through. As the cold front goes by, temperatures will drop. The low-pressure system may continue to cause more precipitation. Be sure to take your umbrella with you tomorrow.

Suggested Responses to Analysis Questions

1. Based on the weather reports and the patterns on the eight maps found at the end of the Student Worksheet and Guide:

a. In what direction does weather generally travel across the United States?

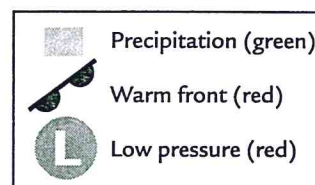
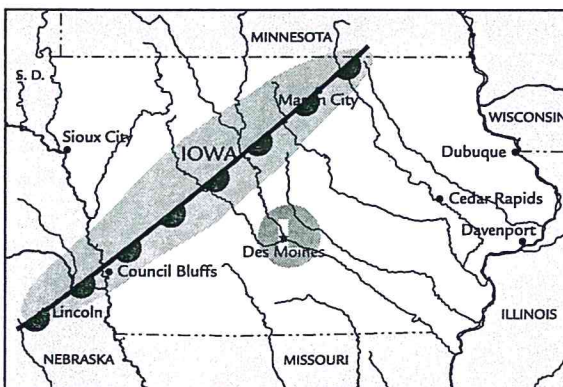
In general, weather moves from west to east across the United States due to the motion of the winds blowing from the west. (If students have had prior instruction about prevailing winds, they may know that this is the global wind pattern that prevails at latitudes 30°–60° North.)

b. How does the movement of the atmosphere over other parts of the country (and world) affect weather locally?

Weather systems can move from one area to another. Global winds can help drive this movement. So weather that seems like it only exists in one area may have traveled from another area. In the United States, this means that the weather west of a particular location is likely to travel east and occur locally.

2. Below is weather data collected for Iowa on September 15. Use the information provided and your knowledge of weather maps to place the appropriate weather symbols on the map of Iowa. Be sure to construct a key for your map.

- Warm front extending from Lincoln, Nebraska northeast to Mason City, Iowa
- Rain all along the warm front
- Low-pressure system in and around Des Moines, Iowa



3. People often complain about the unreliability of weather forecasts. Why do you think meteorologists are sometimes wrong about what the weather will be like?

While answers will vary, students may be more likely to have observed that the movement of weather systems is difficult to predict. In some cases, weather systems dissipate before they arrive at a particular place or they may form unexpectedly. In other cases, weather systems may not move as predicted. Overall, weather is hard to predict because its occurrence is based on many variables that are constantly changing.