

Weather

Time: 6-7 hours

4th grade standards:

I&E6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- a. Differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe and partly from how they interpret their observations.
- b. Measure and estimate the weight, length, or volume of objects.
- c. Formulate and justify predictions based on cause-and-effect relationships.
- d. Conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.
- e. Construct and interpret graphs from measurements.
- f. Follow a set of written instructions for a scientific investigation.

5th grade standards:

ES4. Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. As a basis for understanding this concept:

- a. Students know uneven heating of Earth causes air movements (convection currents).
- b. Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.
- c. Students know the causes and effects of different types of severe weather.
- d. Students know how to use weather maps and data to predict local weather and know that weather forecasts depend on many variables.
- e. Students know that the Earth's atmosphere exerts a pressure that decreases with distance above Earth's surface and that at any point it exerts this pressure equally in all directions.

I&E6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- b. Develop a testable question.
- c. Plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.
- f. Select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
- g. Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.
- h. Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.
- i. Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions.

Objective: The goal of this lesson is for students to better understand various weather phenomena, how to study them, and how to predict their affects both locally and nationally. Students will think about the local and global impact of extreme weather conditions as meteorologists, both qualitatively and quantitatively.

Learn about local weather and how it affects our daily lives

Build weather instruments that will collect data

Compile and synthesize data that can be used to make forecast predictions and applied to graphs/models

Day 1: What is weather?

1. What do you think of when you hear the word “weather”? Brainstorm a list of ideas and write them on the board.

Weather is the specific condition of the atmosphere at a particular place and time.

2. How does weather affect your daily life? Discuss how weather can play a pivotal role in what you wear and what activities you might do.
3. What clues can you use to tell you what the weather will be like? What tools do meteorologists use to predict the weather?

4. The students will now have a chance to become a “meteorologist” and use tools that meteorologists use on a daily basis to study the weather.

Student Worksheet - Activity 1: Make a Weather Station

Discuss and answer the following questions.

1. What do you think of when you hear the word "weather"?
2. How does weather affect our daily lives? (Ex. what kinds of clothes do you wear, outdoor activities that you do, etc.)
3. What kinds of things would you look for if you wanted to describe the weather of a particular day to someone else?
4. What kinds of information are important to collect?

Weather Right Now

Collect data from Spark Computers. Record results outside. What kind of things is the instrument measuring? Are weather conditions different if taken from inside the class room?

Instrument Experts

Tell students that over the next few days they will build a class weather station that can be used to collect local weather data.

Break class into groups of four; assign each group a weather instrument. Have each group become experts on their instrument.

(Example: What is a barometer? How does it work? Why is it important for forecasting weather?)

Pass out weather instrument packets and have girls learn about their instrument.

Day 2: Build a Weather Station

Local Weather

Take readings from the handhelds and add information to weather data charts. Has there been a significant change since the last data entry? Why or why not.

Materials: Weather instrument packets and materials to build

Thermometer-

- o Rubbing Alcohol
- o Water
- o Cylinder shaped clear jar or bottle (bottles with a narrow neck work best)
- o 1 straw
- o Modeling clay
- o Food coloring

Wind Vane

- o Tag board or manila file folder
- o Straight pin
- o Scissors
- o Glue
- o Pencil with a new eraser
- o Plastic drinking straw
- o Modeling clay
- o Paper plate

Anemometer

- o 4 small paper cups
- o 4 plastic drinking straws
- o tape
- o scissors
- o straight pin
- o pencil with a new eraser
- o stapler

Barometer

- o wide-mouthed glass jar or small coffee can
- o balloon (recommended) or plastic wrap

- o rubber band
- o scissors
- o drinking straw
- o cardboard strip
- o glue (recommended) or tape
- o ruler and pen or pencil
- o small piece of modeling clay
- o shoe-box sized cardboard box

Rain Gauge**

- o Clear plastic ruler
- o Cylinder shaped clear jar (e.g. an olive jar)
- o Rubber band
- o Funnel
- o Transparent tape

** Quick design and not much rain in SD. Use as extra activity/example if needed.

Weather Instrument Construction

1. Have girls get into their “expert” groups. Provide weather instrument packets and all materials needed for construction.
2. Have groups build 1-2 instruments depending of the size of the group.
3. Once students complete their instruments have them take a reading. Does your homemade instrument work as well as the handheld? Why or why not. What experiments could you do to see if your instruments are working correctly?

Day 3: Local Weather

1. Collect and record weather data from handhelds. How does the handheld information compare to the homemade instrument?

2. Have “expert” groups graph their instrument’s data. What can that information tell you about the weather?

Meteorologist Mix

Have each expert group share their knowledge of the instrument they have been working with. How does it work? Why is it important in weather forecasting? Was their homemade model accurate? What did their graph show?

If time permits:

- Talk about San Diego’s local weather. Would your instruments act differently if used in a desert or a cold climate area?
- Make a Rain Gauge
- Make a class prediction of next week’s weather

Day 4/5: Hurricanes, Tornadoes and Earthquakes

Materials:

Glass coffee beverage bottle

Hard boiled egg

Matches

Dry ice

Fish tank

White bins

Heating lamps and book ends

Straws

Pyrex baking dishes

Wooden spoon

Paperclip attached to a string

Index cards

1x3 inch labels or tape

high powered fan

Procedure for Hurricanes:

- Students will be introduced to the three main contributors to hurricanes: pressure, density and water temp. through educator-led demonstrations.
 - Pressure- egg in a bottle demonstration
 - Density- dry ice
 - Water temperature -uneven heating experiment with a bucket of water
- Students will experiment to understand the connection between wind speed and water depth:
 - Students will learn how wind speed increases the height of ocean waves as well as how higher waves occur in shallower water. To begin, gather the proper materials--a 9x13 baking dish, flexible straw, duct tape, water and a ruler. Next, divide the class into small groups or pairs. Instruct students to place their baking dish on top of the desk, bend the straw into an L shape and place the straw so that it touches the short edge of the dish and the longer end is over the middle of the dish. Tape the straw to the inside edge and pour water into the dish until it reaches just below the long end of the straw. One partner blows into the straw, creating wind; a second student should measure and mark that height on the opposite end of the dish. Students then continue blowing--harder and harder--and recording the different heights as they go. Do a second round of this activity with the water level lower or higher than the first time
- Students will experiment to locate the strong and weak points of a hurricane
 - Stir some water in a two liter bowl using a large wooden spoon. Dip a paper clip, attached to a string, in various places of the spinning water - in the center and farther from it. Observe where the paper clip is circling the fastest. Explain to the students that the center of the hurricane is called the Eye. Ask the students whether or not the center was the strongest or weakest point. (They should conclude the eye of the hurricane is the weakest point. Surrounding the Eye is called the Eyewall and this is an area of strong storms surrounding the eye)
- Students will build a hurricane-safe structure out of index cards
 - Students will construct a model building out of index cards that would sustain minimal damage when exposed to "hurricane force winds". Wind can be provided by something such as a leaf blower or high powered fan. The students will be supplied with twenty 3X5 inch index cards, an 8X8 inch cardboard base and a sheet of thirty white blank 1X3 inch labels. Each model building should be at least 11 inches tall and be able to support a 50 gram mass weight.

- Students will investigate the best method to remove water contaminants after a major hurricane like Katrina

Materials:

Tornado materials (refer to website)

Twister in a jar (refer to website)

Toothpicks

Marshmallows

Shake tables

S and P wave activity materials (refer to website)

Procedures for tornadoes and earthquakes:

- Students will make a twister in a jar
(<http://eo.ucar.edu/webweather/tornact3.html>)
- Students will make a tornado to explore updrafts and downdrafts
(<http://eo.ucar.edu/webweather/tornact4.html>)
- Students will construct structures to determine what building design best withstands a quake (earth quake structures with toothpicks and marshmallows on shake tables)
- Students will investigate how S and P waves propagate through the earth from the epicenter of an earthquake
(<http://web.ics.purdue.edu/~braile/edumod/walkrun/walkrun.pdf>)

Day 6: News Reports

Materials:

- Flip cameras
- Butcher paper/maps and other props

Procedures:

- Students will create a news report about a major weather condition. They will need to include information on the condition that they have gathered as well as advice for those watching the news (evacuations, how to stay safe, where the storm may be going, etc)

Day 7: Video Viewing

Materials:

- Computer-to-tv connector
- Popcorn

Procedures:

- Grab the popcorn and watch some news reports!