Wind on Water – What Causes Hurricanes?
Lesson Plan

Grade Level: 6-8 | **Curriculum Focus:** Weather | **Lesson Duration:** Two class periods

Student Objectives

- Learn how hurricanes form
- Perform an experiment to discover the relationship between wind speed and the height of ocean waves.

Materials

- Discovery School video on *unitedstreaming*: *Raging Planet: Hurricane*
  Search for this video by using the video title (or a portion of it) as the keyword.

  Selected clips that support this lesson plan:

  - How a Hurricane Forms
  - Categories of Hurricanes
  - Killer Winds around the World

For each group:

- 9" X 13" baking dish
- Flexible straw
- Duct tape
- Water
- Ruler

Procedures

1. Review with your students what they have learned about the causes and characteristics of hurricanes. Tell them they are going to do an experiment to discover the effects of wind speed and water depth on the height of waves in a hurricane.
2. Divide your class into pairs or small groups, and give each group the materials for the experiment. Demonstrate how to set up the experiment as follows:

   a) Place the baking dish on a desktop.

b) Bend the straw so that it forms an L shape.

c) Place the straw inside the baking dish in the middle of one of the 9-inch sides, so that the shorter end faces straight up, touching the side of the dish, and the longer end is suspended about half an inch over the bottom of the dish. (One open end of the straw will stick straight up, and the other will face the opposite 9-inch side of the dish.)

d) Tape the straw to the inside of the dish to hold it in place.

e) Pour water into the dish until it reaches just *below* the straw. (The straw should not be submerged in water.)

f) Mark the height of the water on the outside of the dish.

3. One partner or group member should blow very gently into the end of the straw that is sticking straight up, creating "wind" over the water in the dish.
4. Another student should observe the water at the opposite end of the straw and mark the wave height on the outside of the dish.
5. Have students measure and record the wave heights, or the distance between the standing water and the top of the waves.
6. Students should repeat the procedure two more times, blowing harder each time, and record their measurements to assess the effect of wind speed on the height of waves.
7. Have students remove the water from the dish, move the straw up closer to the top of the dish, and refill the dish with water until it reaches just under the straw. Then they can repeat the procedure to compare wave height in deeper and shallower water.
8. Have each student write a report describing the experiment in detail, reporting the results, and stating the conclusions he or she drew from the results. They should conclude that: 1) wind speed increases the height of ocean waves; and 2) higher waves occur in shallower water.

Discussion Questions

1. Describe the mechanics of the development of a hurricane.
2. Storm surge water height over open water is not as high as when it reaches land. Assuming the pressure in the eye of the hurricane is the same for both instances, why is this so?
3. Many years ago, there were no laws that forced people to evacuate before a hurricane struck. Now there are mandatory evacuation laws in place. Is this good? Why?
4. Study a cross section of a hurricane and write a journal entry describing what you would see if you actually flew through one. Be sure to include details about any changes you observe within the hurricane itself.
5. Would you like to be a Hurricane Hunter and fly through a hurricane? Why or why not?

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- 3 points: Student report includes complete description of all steps of experiment; accurate, detailed reporting of results; clear statement of conclusions
- 2 points: Student's description of experiment somewhat disorganized or hard to follow; adequate reporting of results; statement of conclusions included.
- 1 point: Student report includes vague or inaccurate description of experiment; adequate reporting of results; statement of conclusions lacking.

Vocabulary

eye

Definition: An area like a hole in the center of a tropical cyclone marked by only light winds or complete calm with no precipitation.

Context: A column of clear air develops in the eye of the storm.

storm surge

Definition: Domes of water produced by the action of cyclonic winds during a hurricane, in which the sea level can be up to five meters higher than normal.

Context: In places where the shoreline is shallow the storm surge can reach 30 feet high.

tropical depression

Definition: A region of low barometric pressure.

Context: If the water temperature is 80 degrees F or more the storm becomes a tropical depression.

typhoon

Definition: A tropical cyclone occurring in the region of the Philippines or the China Sea.

Context: In the western Pacific typhoons are often more powerful because they have more warm sea to travel over to build up their power to full strength.

Academic Standards

National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit http://books.nap.edu.

This lesson plan addresses the following science standards:

- Earth Science: Structure of the earth system

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit

http://www.mcrel.org/compendium/browse.asp.

This lesson plan addresses the following national standards:

- Science—Earth Science: Understands Earth's composition and structure.
- Technology: Understands the relationships among science, technology, society, and the individual.
- Geography—Physical Systems: Knows the physical processes that shape patterns on Earth's surface.

Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- http://school.discovery.com/teachingtools/teachingtools.html