

Tornado In A Bottle

Objective: To visualize a tornado using a simple experiment.

Grade Level: 5-8

Subject(s): Science

Prep Time: 10 – 30 minutes

Duration: 45 minutes

Materials Category: Special

National Education Standards

Science	1b, 2, 3, 5a, 7c
Mathematics	
Technology (ISTE)	
Technology (ITEA)	
Geography	

Materials:

- Student Sheets
- Two 2-liter bottles with caps
- Water
- Food coloring
- Glitter or plastic confetti
- Lamp oil (optional)
- Funnel
- Glue
- Duct tape

Related Links:

Basic Science Supplies—Tornado Tube

http://www.basicssciencesupplies.com/Merchant2/merchant.mv?Screen=PROD&Product_Code=380066&Category_Code=scitoys&Product_Count=28

Education 4 Kids—The Tornado Tube Book

http://edushop.edu4kids.com/catalog/product_info.php?products_id=1482

Tornado Project Online

<http://www.tornadoproject.com/>

Supporting NASAexplores Article(s):

The Sound Of Turbulence

http://www.nasaexplores.com/show2_article.php?id=04-011



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Teacher Sheet(s)

Pre-lesson Instructions

- Duplicate the Student Sheets (one per group).
- Divide the class into groups of four. You can vary the group size based on the number of materials that you have.
- Drill a 3/8-inch hole in the center of each cap. Connect the caps to the top of each other using glue. Reinforce this with duct tape wrapped around the sides. Be sure that the caps will still screw onto the 2-liter bottles. This step can be avoided if you choose to buy a “tornado tube.” See the Related Links.
- Use the funnel to prevent spilling the water when pouring it into the 2-liter bottles. One can be placed at each faucet or source of water for the groups to share.

Background Information

Wind speeds in tornadoes range from values below that of hurricane speeds to more than 300 miles per hour. Unlike hurricanes, which produce high speed winds over large areas, the maximum winds in tornadoes are often confined to extremely small areas. They change greatly over very short distances, even within the funnel itself. The tales of complete destruction of one house next to one that is totally undamaged are true!



In 1971, Dr. T. Theodore Fujita of the University of Chicago devised a six-category scale to classify U.S. tornadoes. The six categories are named F0-F5. These categories are based upon the estimated maximum winds occurring within the funnel. The Fujita Tornado Scale (or the "F Scale") has become the standard scale for estimating wind speeds within tornadoes based upon the damage done to buildings and trees. In fact, all tornadoes are now assigned an F scale. It is used by the National Weather Service and engineers to investigate the damage and structure of tornadoes.

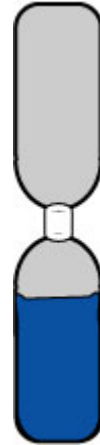


Today's activity will have the students building a tornado simulator. This simulator will show the basic characteristics of a tornado. For visibility purposes, students will use water, instead of air, for their tornadoes. Tornadoes are called vortices based on their properties. Once you have started it, the water will exit through the hole forming a vortex, similar to a tornado. To see the process even better, students will add oil, food coloring, or confetti to the water.



Guidelines

1. Read orally the 5-8 NASAexplores article, “The Sound Of Turbulence.”
2. Distribute the Student Sheets.
3. Ensure that each group has two 2-liter bottles, a tornado cap, and access to water.
4. Have each group fill one of their 2-liters about three-fourths full.
5. Have each group screw on the cap connector.
6. Have each group screw on the empty 2-liter bottle. The tornado simulator should look like an hourglass.
7. Instruct each group to flip over the tornado simulator. The groups need to swirl it to start the process.
8. Have each group record their observations.
9. Have students add oil, food coloring, or confetti, depending on what you have available.
10. Repeat the experiment, and have the groups record their observations.



Discussion / Wrap-up

- Discuss some of the characteristics of tornadoes.
- Remind students of safety procedures during tornadoes. Ask the students if they have a weather safe place to go that has a flashlight, radio, water, and blankets. This safe place should be underground if possible, or in the interior of their homes, where there are no windows.
- Discuss some of the groups’ observations with the class.

Extensions

- Order the Taming The Tornado Tube activity book by Steve Spangler for more ideas.
- Try varying the temperature or amount of the water, the pressure in the bottles, or use another liquid besides water to see if it changes the results.



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Today's activity will have you building a tornado simulator. This simulator will show the basic characteristics of a tornado. To see it better, you will use water, instead of air, for your tornado. Tornadoes are called vortices based on their properties. Once you have started it, the water will exit through the hole forming a vortex, similar to a tornado. To see it even better, you can add oil, food coloring, or confetti to the water.

Materials

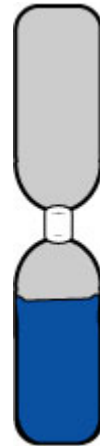
- Two 2-liter bottles
- Tornado cap
- Water
- Food coloring
- Glitter or plastic confetti
- Lamp oil (optional)
- Funnel

Procedure

1. Be sure your group has two 2-liter bottles and the tornado cap.



2. Choose one of the 2-liters. Fill it three-fourths full of water (does not have to be exact).
3. Screw the tornado cap onto the top of the 2-liter bottle.
4. Screw the empty 2-liter bottle to the top of the tornado cap. Your set-up should look like the figure on the right.
5. Quickly, but carefully, flip the two 2-liter bottles over, so that the empty one is on the bottom.
6. Grabbing the top of the tornado simulator, swirl it around to start it.
7. Answer these two questions, and record other observations on the line below:



- a. What is happening to the water as it leaves the upper 2-liter bottle?
 - b. What is happening to the water as it enters the lower 2-liter bottle?
 - c. Other observations: _____
8. Repeat the experiment again. Did you observe the same things? Record any differences here: _____
 9. With the full 2-liter bottle on the bottom, remove the upper 2-liter bottle and the tornado cap.
 10. Add oil, food coloring, or confetti (whatever your teacher provides) to the water. Use the funnel to prevent spilling it.
 11. Attach the tornado cap and empty 2-liter bottle back on top.
 12. Repeat the experiment.
 13. Record your new observations:
 - a. Can you see what is happening better now?
 - b. If you used the oil, what happened to it during the tornado?
 - c. If you used confetti, what happened to it during the tornado?
 - d. Note any new observations: _____

