

3M



Young Scientist Lab

in partnership with:  **Discovery**
EDUCATION

Science of Summer Family Activities

Tornado in a Bottle

Overview

Simulate a tornado with this handmade contraption and learn some weather science along the way. Watch how a vortex forms and moves in the water, and connect the dots to how tornadoes form and function in the real world.

Materials

- two 2-liter plastic soda bottles
- 3M™ Duct Tape
- Scotch™ Precision Scissors
- water
- dishwashing liquid
- food coloring
- glitter or confetti

Thought Starters

Ask these questions before you begin

- *How do tornados form?*
 - *A: The majority of tornadoes are formed during violent thunderstorms. A combination of several different weather conditions (like warm, moist air) must be present, plus a trigger like a strong cold front, plus instability in the upper atmosphere. Basically, the cold air lifts the warm, moist air into the atmosphere, where unstable conditions create havoc.*
- *How is a thunderstorm cloud created?*
 - *A: In an unstable atmosphere, the air temperature decreases rapidly with height. When warm, wet air rises to great heights in an unstable atmosphere, it produces a thunderstorm cloud.*

Activity

- Wash the empty soda bottles. Fill one of the bottles with water 3/4 of the way to the top.
- Add a couple drops of dishwashing liquid to the water. Add a drop of food coloring and the confetti (to make your tornado more visible and dramatic!).
- Criss-cross two 4-inch pieces of duct tape and figure out how to make a small hole (about ¼ inch) in the center. You could use a sharp knife, scissors, hole-punch, knitting needle, chopstick or ball-point pen. Place criss-cross of duct tape over the mouth of the empty bottle. Add extra tape if necessary to seal completely.
- Now place the empty bottle on top of the full bottle, mouth to mouth. Wrap duct tape around the two mouths, using plenty of tape to make sure the seal is secure and leak-proof.
- Now carefully flip the bottles over. Gently swirl the bottles and slowly pick up speed. As the water from the top bottle starts to swirl down into the empty bottle it will create a funnel effect, forming a whirlpool. It looks just like a mini tornado!

Discussion points

- This “tornado in a bottle” is actually a water vortex. A vortex is defined as “a spiral motion of fluid within a limited area, especially a whirling mass of water or air that sucks everything near it toward its center.” Sounds like the definition of a tornado!
- As the mass of water swirls in a circular motion, gravity pulls it down and a powerful vacuum is formed. This is the same effect you see with a tornado funnel—just replace the water with air. Look closely as you do this experiment and you should see the hole in the middle of the vortex.

Links

How Tornadoes Form – Weather.com

<http://www.weather.com/encyclopedia/tornado/form.html>

Inside a Tornado – Discovery Channel

<http://dsc.discovery.com/convergence/tornado/tornado.html>

Discovery News: Redefining Tornado Alleys

<http://news.discovery.com/earth/redefining-tornado-alleys.html>

Storm Chasers: Discovery Channel

<http://dsc.discovery.com/tv/storm-chasers/storm-chasers.html>

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