

Tornado Tube Classroom Discovery Kit

Designed to meet these objectives:

Science

- Students will conduct simple investigations.
- Students will acquire information from observation and experimentation.

Your students can easily create “bottled tornadoes” with this exciting kit! They’re fascinating to watch—and they provide a terrific hands-on opportunity to explore the properties of liquids and air pressure.

What’s Included

- 8 plastic liter bottles
- 4 Tornado Tubes
- 24 nontoxic color tablets



WARNING:

CHOKING HAZARD—Small parts.
Not for children under 3 yrs.

Getting Started

The Tornado Tubes are easy to set up. Add water to one of the plastic bottles until it is about $\frac{2}{3}$ full. Screw the Tornado Tube onto the bottle, and then turn an empty bottle upside down and screw it onto the other end of the Tornado Tube.

Ask students to predict what will happen when you turn the assembled bottles upside down. Write their predictions on the board or chart paper, and then hold the bottles by the tube (so you won't accidentally squeeze one), flip them over, and set them on a flat surface. What happens?

Not much! A few drops may leak into the lower bottle, but that's it. Why doesn't the water flow down?

Discuss students' ideas. Point out that although the lower bottle looks empty, it's actually full of air. Before water can move into the lower bottle, some air must move out. Because the hole in the Tornado Tube is small, the water's *surface tension* (the "skin" of the water) is strong. The air can't get through it, so it has nowhere to go.

Go with the Flow!

Gently squeeze the lower bottle. This increases the pressure of the air so it can break through the water's surface. Air bubbles rise into the upper bottle. When you release the pressure on the lower bottle, water flows down to replace the air that left.

What will happen if you squeeze the upper bottle? Discuss the possibilities with students, then ask a volunteer to try it. Increasing the pressure in the upper bottle forces water to move past the air. When you release the pressure, air bubbles rise to replace the water.

Tornado Time

Show students how to start a tornado in the bottle: with the upper bottle about $\frac{2}{3}$ full of water, hold the Tornado Tube and move your hand in small circles in either direction. As the water swirls around in the bottle, a *vortex* (tornado) will begin to form in the center. Set the bottles down and observe what happens.

Students should see that the vortex gets faster and stronger as water flows rapidly into the lower bottle. To understand why, have students look carefully at the vortex. Can they see the column of air at the center of the tornado? Now the water and air don't have to "take turns" passing through the little hole in the Tornado Tube. Instead, the water goes down the outside of the vortex while air rises up through the center.

Slippery Soap

After observing what happens with plain water, add some liquid dish soap to the water and repeat the experiments. Once again, have students predict what will happen when you turn the bottles upside down. They may be surprised to see that water trickles down as tiny bub-

bles rise up! Explain that soap reduces the surface tension of the water. Air bubbles can break through, leaving room for water in the lower bottle.

Swirl the soapy water to create a tornado and then set the bottles down. Does the soapy tornado look the same as the plain water tornado did? (You may want to make a plain water tornado in a second set of bottles so children can compare them easily.)

Keep watching, and you will probably see the tornado stop all on its own. Small bubbles will rise and water will trickle down as before. Explain that the soap bubbles in the water broke up the vortex action. Instead of spinning faster and faster, the vortex slowed down until it stopped spinning altogether.

Color Fun

The color tablets can be used to color the water in your experiments for a more dramatic effect. (Don't make the color too strong, or the tornado action will be hard to see.) You can also use the Tornado Tubes to add some excitement to color mixing experiments. Fill a bottle about $\frac{1}{3}$ full with colored water. Fill a second bottle $\frac{1}{3}$ full with a different color. Hold the bottles horizontally over a sink and connect them with a Tornado Tube. Then, swirl the bottles to start the tornado and watch the colors mix together. (Be sure to have students predict and record the results of various combinations, such as "blue + red = purple.")