



OZ'S AWESOME TWISTER

CHALLENGE ACTIVITY

Dorothy and Toto were whipped away from Kansas in a magical tornado and taken to Oz. But there is no place like home and they desperately want to go back to see Aunt Em and Uncle Henry.

Today, your challenge is to create your own tornado. And maybe, your tornado can bring them safely back home.

Video link:

GETTING READY

Summary:

Have you seen the movie *The Wizard of Oz*? In the movie, the main character Dorothy and her dog, Toto, are carried away by a tornado and end up in a fantasy land called Oz. While tornadoes do not safely carry people to magical places, they can be extremely dangerous and cause terrible damage. In this activity, you will make your own tornado and explore how they form.

Active Time:

- 20-30 minutes

Total Project Time:

- 20-30 minutes

Key Concepts:

Weather, Vortex, Centripetal Force

MATERIALS

You will need:

- Oz's Awesome Twister Log Book pages (download or use your own notebook)
- 2 mason jars of any size (jars or bottles with a tight fitting lids or caps such as an empty peanut butter or spaghetti sauce jar, or a plastic water bottle). Jars do not have to match in size or shape.
- Water
- Liquid dish soap
- Sprinkles (optional)
- Food coloring (optional)
- Glitter (optional)

BACKGROUND

A tornado is a type of storm in which powerful winds form a column that reaches from a cloud down toward the ground. Tornadoes, also called twisters or cyclones, often form during very strong thunderstorms. A thunderstorm occurs when warm air near the ground meets cold air from above. If

these two air masses meet and the change of wind direction and wind speed is strong enough, the air will begin to rotate and a tornado is produced.

Tornadoes, hurricanes, and waterspouts (tornadoes that form over a body of water) are all formed from centripetal force. These storms swirl in a circle. When objects move in a curved or circular path and not along a straight line, an inward force which directs the objects (or fluid such as water), towards the center of its circular path. This force is called **centripetal force**. **Centripetal force** keeps the object moving in its circular path by pulling the object or fluid towards the center of the circle.

In a tornado, the circular motion of the air forces water droplets towards the center of its circle and creates a water **vortex**. A **vortex** is a spinning flow of fluid. As the **vortex** forms, more water droplets gather around it, and eventually it grows large enough to become a visible tornado. The column that we see as the tornado is called a funnel cloud. A funnel cloud is shaped like a cone, pillar, or tube. It can range from a few feet to hundreds of feet wide. The winds of a funnel usually spin counterclockwise in the Northern Hemisphere, and clockwise in the Southern Hemisphere.



The winds inside the tornado can reach speeds of up to 300 miles per hour and are the strongest winds on earth- much stronger than the winds of a hurricane or cyclone. For perspective, New Hampshire's own Mt. Washington set the world record for the highest wind speed ever recorded on the surface of the earth on April 12, 1934 with a wind of 231 miles per hour. This record was finally broken in 1996, when wind with speed of 253 miles per hour was recorded during Tropical Cyclone Olivia in Barrow Island, Australia.

Tornadoes typically last only 2-3 minutes, but stronger ones can last up to 15 minutes or longer. The high winds of a tornado can flatten buildings and lift heavy objects, such as cars and trucks, into the air. Once a tornado touches the ground it can travel across land about 28 miles per hour, usually moving west to east. However, most tornadoes are quick and do not cause much damage.

It is not fully understood how exactly tornadoes form, grow and die. Tornado researchers are still trying to solve the tornado puzzle, but for every piece that seems to fit, they often uncover new pieces that need to be studied.

Tornado Safety

While tornadoes can be really cool to watch, you should never get near a tornado! Instead, you should immediately find shelter. It is best to go to a basement or a shelter underground or in the interior part of a house on the lowest floor where there are no windows (bathroom or closet). If you can, get under a sturdy piece of furniture such as a table. Crouch down on your knees and protect your head with your arms. If you are in your car, do not try to outrun the storm. Get out of the car and find a low point on the ground, like a ditch, and lie flat. If you are outside, do the same, by finding a low spot on the ground where you can

lie flat on your stomach and put your arms over your head for protection. As always, stay away from fallen power lines and out of damaged areas.




INSTRUCTIONS

Follow these instructions to get started.

1. Fill one mason jar or bottle about $\frac{3}{4}$ full of water.
2. Drop 1-2 (no more!) drops of liquid dish soap into the water.
3. Add a sprinkle of glitter and/or sprinkles.
4. Close the lid and seal it tightly on the jar or bottle.
5. Now, shake the jar or bottle using a circular motion. You may need to try several times or for a longer period of time in order to reveal your tornado. *Tip: place the bottom of the jar on the counter or table and move it quickly in a circle to create the circular motion.*
6. Repeat the experiment, but this time add 1-2 drops of food coloring (do not be tempted to add more food coloring!) when you add the liquid dish soap. You may add sprinkles or glitter if you wish.

EXPLORE

As you play with your tornado, think about:

-  What happens if you simply shake the bottle (do not swirl it)?
-  What happens if you do not add the dish soap?
-  What happens when you add food coloring?

EXPLAIN

A tornado (**vortex**) is formed in the center of the jar when you spin it in a circular motion. The water begins to rapidly spin around the center of the **vortex** due to **centripetal force**, which forces the water toward the center of the jar. As more water gathers around the **vortex**, the tornado becomes larger. The reason you can see it when you add dish soap is because the soap creates small bubbles, making the **vortex** more visible. The glitter is just for fun.

You can find **vortices** in many places. A water **vortex** is formed when you flush the toilet or drain your sink or bathtub. You also see **vortices** in the weather, such as in tornadoes, hurricanes and waterspouts (a tornado that forms over water).

Learn more about inventing and find more activities on our website: www.fuelthepark.org.