

Convection Currents for Kids

Grade 5

Authors: Sarah Fortner, Penny Sanecki

References:

<http://eo.ucar.edu/webweather/tornact2.html>

http://www.exploratorium.edu/snacks/convection_currents.html

Benchmarks & Objectives:

PS-3 Describe that electrical currents in a circuit can produce thermal energy

Materials:

From Exploratorium website

- 12 volt battery
- pencil lead
- white posterboard
- light source
- 2 electrical lead wires
- tap water
- Food coloring
- Ice cubes dyed blue
- Plastic containers (1 for demo, and 1 per group for hands-on follow-up)

Initial Demonstration:

Demonstrate heat convection using electricity in front of the kids.

From the Exploratorium:

- 1) Fill the container with water and place wires and pencil lead in it (position the lead horizontally).
- 2) Connect the wires to the terminals of the battery
- 3) Heating begins
- 4) Shine light through the water onto a white posterboard
- 5) Add drops of food coloring

For diagrams and more see:

http://www.exploratorium.edu/snacks/convection_currents.html (the generation of an electrical current makes the warm water rise through the cooler water, food coloring is added so you can see the movement of the water as it is heated)

Observations:

Ask students to observe the warm water rising to the surface. Ask them if they notice anything about the refraction of light that would help them to see the different densities of water (if they have already completed the light unit they will see that the light is bent differently for warm and cold water... try sticking a straw in the experiment).

Part 2- Hands on Convection Exercise:

After completing the demonstration, have the kids create their own convection currents using ice cubes and tap water.

Procedure:

1. Fill clear containers (rectangular shape is best) 2/3 full with tap water. (Should be enough containers for the kids to work in groups of 4-6)
2. Have the students touch ice cubes and record observations, they should compare the temperature to tap water (while water is settling).
3. Students should then drop one or two ice cubes into one side of the bottle.
4. They should predict what that will do to the surrounding water .
5. Next students should put a drop of red food coloring in the non-ice cube side of the container. (Red colored hot water may also be slowly added to this side, or something hot that will bleed its dye, maybe a red tea bag that hasn't seeped long)
6. Students will have to diagram where the red and blue go in their journals.
7. Students will compare how this relates to the electrical current demonstration.

Discussion:

- Students should be able to visualize how convection works. (Hot water rising through cold water)
- Students should discuss how electrical currents generate heat? (We generated a convection current with the initial demonstration)
- Students may consider- How does convection operate in our atmosphere, in our oceans?
- For instance, ask- where does this heated air go? Think of the ground getting warm on a sunny day. (Solar radiation heats the ground and this warm air rises, as it cools we see clouds form).
- Why do we travel in hot air balloons and not cold air balloons? (Heat makes the air less dense and lifts the balloon in the colder surrounding air).

Summary

- Convection is the movement of currents (liquids and gases).
- Convection currents are created in response to thermal energy variations.

- Electrical currents generate heat, which may be used to produce convection currents.