

Topics: Pressure, Potential and Kinetic Energy; Properties of Liquids

Materials List

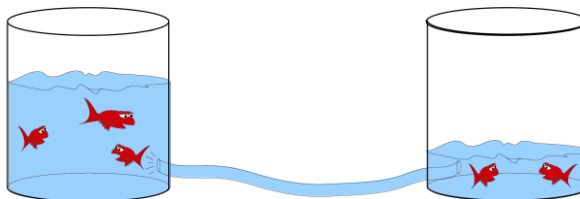
- ✓ Flexible tubing 30 cm (1 ft.)
- ✓ 2 liquid holding containers
- ✓ Hot glue or silicone sealant
- ✓ Water

This activity can be used to teach:

- Structure of matter (Next Generation Science Standards: Grade 5, Physical Science, 1-1, Middle School, Physical Science, 1-1)
- Forces & Motion (Next Generation Science Standards: Grade 3, Physical Science, 2-1, 2-2, Middle School, Physical Science, 2-2)
- Gravity (Next Generation Science Standards: Grade 5, Physical Science, 2-1)

On the Level

Control the Flow of Liquid Using Gravity



Explore the relationship between gravity, pressure, and the flow of liquids!

Assembly

1. Drill a hole in the side of each of the container near the bottom. The holes in the containers should be the same diameter as the outside diameter of the tubing.
2. Insert one end of the tubing into each container's hole.
3. Make the container/tubing junction watertight by covering it with a generous amount of hot glue or silicone sealant. Allow sufficient time for the glue to cool or for the sealant to dry.

To Do and Notice

(Use safe lab practices: water from experiments is **not** for drinking.)

1. Add water to one of the containers. Notice that the liquid will flow through the tubing to the other container until the level of liquid in one container is the same the level (elevation) as the liquid in the other container.
2. Alternate raising and lowering each container. What happens?

The Science Behind the Activity

Water is a liquid. A liquid will take on the shape of its container. The top surface of a contained liquid appears to be flat or level. Earth's gravity pulls down on individual water molecules until they have the lowest possible overall potential energy. In other words, the water cannot "fall" further toward the center of the Earth. A container with a hole in it provides a way for the water to fall further. With two containers on a level surface the water will flow as long as some of the water is higher (has more potential energy) than the water in the other container. The flow stops when the level is the same in both containers as all the water now has the lowest overall potential energy. The rate of flow between the containers is affected by the pressure difference at the two holes in the containers. As the difference in the heights of the water decreases the pressure difference will also decrease. A decreasing pressure difference will lead to a slower rate of flow until the pressure is equalized and the flow stops. When one container is moved higher than the other the water in the higher container will have more potential energy. That water will fall/flow out until all the water has the lowest possible overall potential energy again.

Taking It Further

- Have students take down data on the volume of each container as time passes. Use the data to calculate the net change in volume during 5 or 10 second intervals. Graph the net changes over time.
- Test the apparatus using other non-toxic liquids that have different viscosities (thickness, or resistance to flow) than water such as cooking oil, honey or molasses. You may need to use tubing with a larger inside diameter.

Web Resources (Visit www.raft.net/raft-idea?isid=250 for more resources!)