Water in a Straw

(Reinforcement Activity)

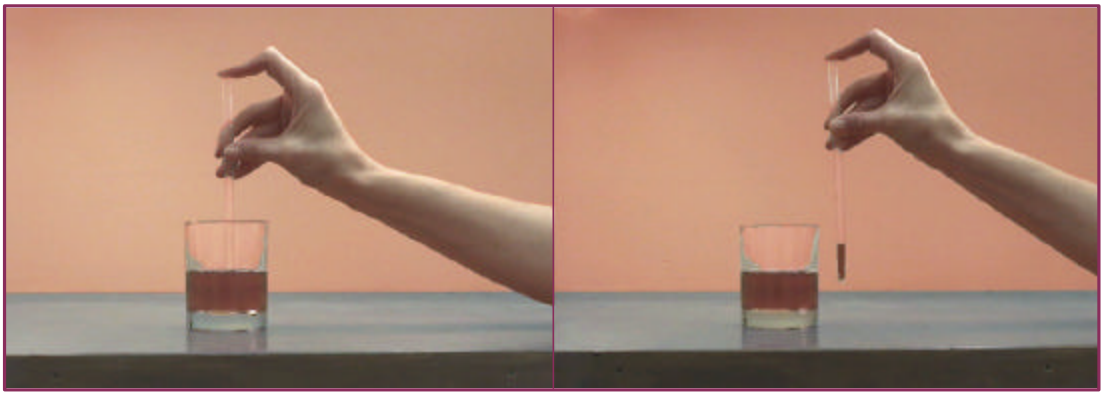
In this activity, students experiment with water in a straw by placing a finger over the top of a straw and taking the straw out of the cup. Students consider what this activity suggests about the nature of air pressure.

Materials

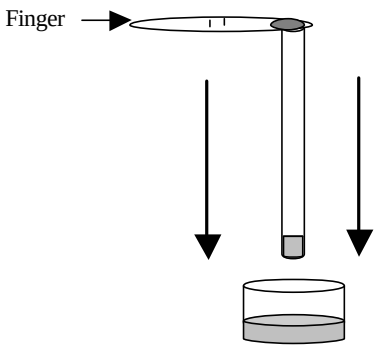
- Straw, 1 per student
- Cup of water, 1 per student

Steps

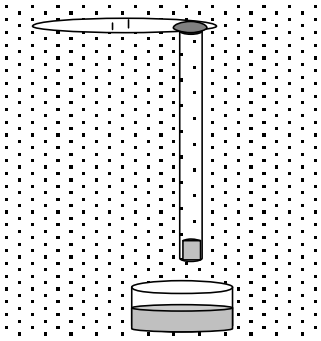
- Give each student a straw and a cup of water. Ask them to put the straw in the water and place one finger over the top of the straw. Then they should lift the straw out of the water. What happens? *(The water should stay in the straw.)*
- Can they turn the straw at different angles? *(Yes.)* Can they turn it upside down? *(Yes.)*
- Will the water stay in the straw if you put the straw in a taller glass, completely under water, and pick it up with water filling the entire straw? *(Yes.)*



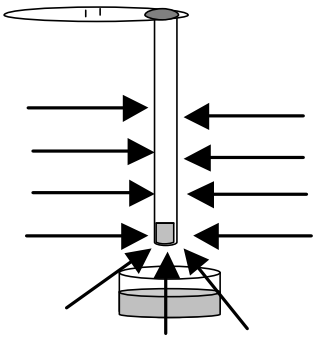
- Ask, "Given what you know about air pressure, what do you think is going on?" Collect a few ideas.
- Have students draw a model based on what they learned about air pressure in this lesson.
- Discuss their models in terms of the nature of pressure and whether this offers convincing evidence that it is omnidirectional as opposed to unidirectional. (*Air pressure is approximately 14.75 lbs. per square inch in all directions. At this point in the module, explain to the students that the outside air pressure is pushing in all directions, including up on the bottom of the straw and therefore is holding the water in the straw. See the note below about a more complete explanation to be shared with students following Section 3.)*



Unidirectional model



Omnidirectional model using dots



Omnidirectional model using arrows

Note to Teacher: What happens in this activity is more completely explained using relational causality and Boyle's Law (which is addressed in the next section). In the case where there is still some air in the straw, some water actually drips out, but because the top of the straw is sealed off, no more air can enter. As described by Boyle's Law, the air in the straw spreads out because the volume of the air space has increased, and exerts less pressure than the air outside the straw. Thus the lower pressure air in the straw and the water pressure are less than the outside air pressure keeping the water in.

Follow-up Questions for Class Discussion

- What made sense to you about this experiment?
- What did not make sense to you?
- Is this convincing evidence that air pressure behaves in an omnidirectional manner?