



Princeton & NYU Discoveries in Action



# Do science from home: Escaping Water Experiment!

## Begin doing science by introducing our new concept

Water is a liquid. If I want the smallest bit of water from my cup, I could take a drop. But if I divided this drop in half, I have two smaller drops. If I keep doing this, I'd get smaller and smaller drops until I need a microscope. Eventually, I'd see that the smallest piece of water is a molecule made of up two hydrogen atoms and one oxygen atom, that's what H<sub>2</sub>O means!

During this process of dividing water droplets, I observed that the water wanted to stay together and not be pulled apart. You can observe this yourself if you put one drop next to another drop, they will jump together to form one bigger drop instead of staying neighbours. This is because there is a force between each water molecule called **cohesion**. This force means that water tries to stay together as one blob.

Water doesn't only want to stick together it also likes to stick to other things! If you put a leaf on your hand and you shake it off it falls to the ground, but if you get water on your hand and you shake it off, there is still water there! **Adhesion** is the force that helps water stick to other things.

## Equipment:

- Two glasses
- Water
- Paper towel
- Optional: food coloring



## Methods for doing science:

- 1** Fill one glass of water approximately 4/5th full and place the other empty glass directly next to it. Optional: add 2-4 drops of food coloring to the water.
- 2** Twist a paper towel until it forms something that looks a little like a piece of rope.
- 3** Submerge approximately 1/3 of the twisted paper towel in the glass with water and drape the remaining part of the paper towel into the empty glass.

## Do science by discussing our results:

What did you observe?

Do you think all the water will go to the other glass? When might it stop?

What if we tried two paper towels instead of one, which would be faster? Why?

Would this experiment work with other liquids like juice or salt water? Why or why not?

## Explanation

Paper towels have many tiny holes, this gives the water lots of places to stick to. As the **adhesive** force draws the water in to fill these holes to stick to all the surfaces, the rest of the water in the glass follows due to the **cohesive** forces between water molecules.

This combination of **adhesive** and **cohesive** forces allow the water to “climb” up the paper towel and over to the other empty glass. This “climbing” is called **capillary action**.

When the water reaches the end of the paper towel rope, gravity continues to pull the water down. So drops of water fall into the empty glass. At first, because the glass is empty, there is more gravity acting on the water in the empty glass than on the full glass. But as the water fills the second glass, the paper towel is submerged and the gravity working on each end of the paper towel pulling the water down balances out. The empty glass now has water that has cohesive and adhesive forces that are working against the first glass's cohesive and adhesive forces. Essentially it's a water tug of war! The forces pulling the water into the empty glass and the forces of the water in the first glass balance out. This is why the glass stops filling once there is equal water between glasses!