

Classroom Experiment: Cohesion & Adhesion

Objective: Introduce students to light and cohesion using **action-focused language** to increase their engagement and persistence, and confidence in doing science.

Materials needed to do science:

- Tub, sink or large bowl to partially fill with water
- Assorted objects to test such as: coin, paper clip, Lego, shell, balloon (inflated or deflated), pencil, tangerine (to test both with peel on and without), pinecone, sponge

IMPORTANT NOTE

Students will benefit most if action focused language is repeated throughout the science lesson. Introduce each step by saying "We're going to do science and..." and explain to students that "Doing science means learning about the world." You can incorporate action focused language into any science lesson, so feel free to change the experiment as you see fit. Have fun doing science!

Introduce new concept "Today we will be doing science!"

Explain to students that they will be "**doing science to learn about cohesion.**" You can begin by providing some background on the makeup of water. "Water is a liquid. Imagine we have a drop of water. If I divide this drop in half, we have two smaller drops. If I keep doing this, we'd get smaller and smaller drops until we needed a microscope. Eventually, we'd see that the smallest piece of water is a molecule made of up two hydrogen atoms and one oxygen atom, that's what H₂O means!" Then, introduce cohesion. "During this process of dividing water droplets, I observed that the water wanted to stick together instead of being pulled apart. 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.

Experiment Set Up

Explain to your students that you will be "**doing science to set up the experiment.**" Gather the class and fill one glass of water approximately 4/5ths full and place the other empty glass directly next to it. Twist a paper towel until it forms a small rope and submerge one end in the full cup and 1 end in the empty cup. Then, wait and watch as the water slowly travels from one cup to

another. This process takes a few hours, so it may be best to transition to another activity and check in periodically.

Experiment 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!

Our research has found that action focused language can increase science engagement, persistence, and confidence in kids from diverse backgrounds. It is our goal to increase the amount of action focused language children hear about science to reduce disparities in STEM. We know how hard teachers work, so we wanted to ensure that implementing action focused language in the classroom was as easy as possible. If you have any questions, comments, or concerns, please contact us at www.kidconcepts.org. Thank you for reading!

Best,
NYU Science Initiative

ACTION-FOCUSED LANGUAGE EXAMPLES

- "Today, we're going to do science"
- "Doing science is the process of discovering new things"
- "If we practice, we will get better at doing science."



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