Classroom Activity

90-SECOND SCIENCE

Water sketching hands-on activity

Explain it: How can you draw on the surface of a liquid?

Estimated time: 15–20 minutes

Grades: K–12, for individuals or small groups

Description: Students experiment with the properties of cohesion and adhesion using dry erase markers and water.

Content topics: Cohesion and adhesion, properties of matter

Materials:

- Dry erase markers (or other markers you have on hand)
- 1 smooth glass plate or piece of smooth glass
- 1 tub or container large enough to submerge the glass

Phenomenon background

Cohesion: A property of water that makes its molecules attracted to each other. In other words, the molecules in water like to stick together; this is why water droplets form.

Adhesion: The tendency of water molecules to be attracted to other substances. This means that water sticks to surfaces. You can observe this when water droplets form and stick to the side of a drinking glass.

Properties of matter: The different characteristics of a substance. For example, water is a liquid at room temperature, and it is able to dissolve some other substances.

Capillary action: The ability of a liquid, like water, to move against gravity in a small space, like a tube. Capillary action exists because of the forces of cohesion, adhesion, and surface tension.

Procedure

1

Draw a simple drawing on the glass using thick lines. Let it dry. Add about 2 inches (5 cm) of water into the container.

2

Tip the glass into the water **very slowly** and at an angle, allowing the water to creep up to the edge of the drawing.

3

As the water makes contact with the drawing, continue very slowly letting the water move onto the drawing. The drawing should lift off of the glass.

Continued

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Gather information

What do we know?

- **Ask:** What do we mean when we say something is “sticky”? Can you list some substances that are sticky? Why do you think they stick to other things? Can you peel marker ink off a piece of paper? If you clean washable marker off a surface, is anything left? Why or why not?
- **Guide:** Why can’t you draw on water? How can you get marker off of glass without losing your art? Have students brainstorm and write down their ideas. If students feel stuck, try asking “Can you tell me more about that?” or “Can you give me an example?”
- **Make a claim:** If we draw on the glass and submerge the glass in water, then the drawing will _____ because _____ .

Take action

Follow the procedure on the first page.

What could go wrong?

- The water could approach the drawing too quickly and, instead of moving behind the drawing, run over top of it, causing the drawing not to lift. If that happens, dry off the glass, erase the drawing, and try again.
- The lines of the drawing may not be thick enough and may break apart as they lift off of the glass.
- If the lines of the drawing are not connected, the individual parts of the drawing will lift off independent of each other. Either warn students of this beforehand or let them experience it and ask them how they could keep the drawing from separating.
- Some markers work better than others. Try out markers before the experiment or have students complete the activity with various types of markers and compare the results.

Explore the evidence

- **Ask:** Why do you think the drawing lifts off of the glass?
- **Ask:** Why does the drawing keep its shape when it lifts off of the glass?
- **Ask:** Why did some drawings not lift off of the glass?
- **Ask:** Would this work with other markers?
- **Ask:** Would this work on something other than glass?
- **Ask:** Does changing temperature change the result?
- **Ask:** Is there a practical application for this experiment?
- **Ask:** What additional questions do you have?

Teacher tips:

- Have students write a claim of what they individually think may be happening.
- Remember to only gather student input at this point and not push for or reveal right or wrong answers.
- Guide students to the idea of a property that makes substances stick to themselves and a property that makes substances stick to other things. Once students have articulated these ideas, introduce them to the terms and concepts of **adhesion**, **cohesion**, and, depending on students’ developmental age, **capillary action**.

Continued

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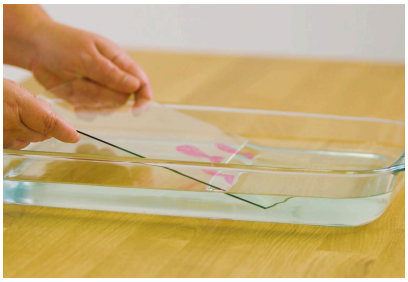
Apply reasoning

What is the science?

The ink in the marker first adheres to the glass plate. When the water reaches the edge of the glass, the water's property of adhesion causes it to partially climb the glass. Because the water does so at such a sharp angle, it is able to move behind the ink. Capillary action then pulls the water further behind the ink, pushing the ink away from the glass. Because the ink is less dense than the water, it then floats on top of the water. The cohesive property of the ink causes it to stick to itself and retain the shape of the drawing.



Take it further

Depending on the types of questions students generated, you might:

- Explore the adhesive property of the floating ink. Will it adhere to something else after floating? Does the experiment work with other types of markers?
- Explore the cohesive property of the floating ink. Can it be picked up and retain its shape? What causes it to break apart?
- Explore engineering applications. How could this process be used to create something new or solve a problem?
- Explore capillary action with hands-on experiments like Paper Chromatography.

Keep exploring

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