

GIVE SPARK · HANDS-ON SCIENCE LAB

A Mountain of Water

Does adding soap change how many drops a coin can hold?

Teacher Guide

Grades 3–5 · Properties of water · 55 minutes

FREE LAB

OVERVIEW

The lab at a glance

One lesson, one driving question and a coin that holds more water than children expect.

THE DRIVING QUESTION

Does adding soap change how many drops a coin can hold?

Children predict first, then count drops on two coins to find out.

What children do

Pairs add plain water to a coin one drop at a time and count how many drops it holds before the water spills. They do the same on a second coin with diluted soapy water. They repeat both three times, then compare the counts and the shape the water made.

What children learn

Water can pile up into a raised dome on a coin before it spills. Children find out from their own counts whether a little soap changes that. They also meet two ideas about evidence. Counts vary from one round to the next, and a pattern across several rounds and several pairs is stronger than a single result.

Success looks like

1. I kept the coin, the coin side, the dropper height and the way I squeezed the same.
2. I counted three rounds for each liquid and recorded every count.
3. I said what my results showed and used my counts as evidence.

What to keep the same

WE CHANGE	WE COUNT	WE KEEP THE SAME
The liquid: plain water or soapy water	Drops held before the water first spills	The kind of coin, the side facing up, the dropper height and the size of the drops as far as possible

AT A GLANCE

Time: 55 minutes.

Grouping: pairs. One child drops and one counts, then they swap.

Standards link: practices planning a fair test and repeating measurements, which are NGSS science practices for grades 3–5. It does not cover a full performance expectation.

SESSION PLAN

STAGE	MIN
Introduce the phenomenon	5
Predict and plan	7
Run the first comparison	12
Repeat	13
Compare results	12
Close	6
Total	**55**

THE STUDENT RESOURCE

A separate one-page PDF with the prediction, the results table, a space to draw the two water shapes and the closing sentences.

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PREPARATION

Get ready

What to gather, how to mix the soapy water and one dropping rule for every round.

Materials

For each pair

- 2 identical coins
- 2 matching droppers
- 2 small labeled cups, one of plain water and one of soapy water
- A tray and paper towels
- The student page and a pencil



Two coins, two droppers and two cups for each pair. Label everything before the lesson.

Mix the soapy water

Make one batch for the class. Gently stir about 1 mL of dish soap into 100 mL of water. Stir slowly so that it does not foam.

SAFETY

Keep the liquids away from mouths and eyes. Wipe up spills promptly so the floor does not get slippery.

Before the lesson

1. Clean and rinse the coins, then dry them.
2. Label the cups and the droppers “plain” and “soapy”, so soap never gets into the plain water.
3. Choose which side of the coin faces up. Every pair uses that side for every round.

WHY TWO OF EVERYTHING

A dropper that has touched soapy water carries soap with it. Separate coins, droppers and cups keep the two liquids apart for the whole lesson.

The dropping rule

1. Place a clean, dry coin flat in the tray.
2. Hold the dropper upright just above the center of the coin.
3. Add one drop at a time with gentle, even squeezes. Do not touch the dome.
4. Count the drops until water first spills over the edge.
5. Record the number the coin held before the drop that made it spill.

Between rounds

Dry the plain-water coin with a paper towel. Rinse the soapy-water coin in clean water and dry it, and keep it apart from the plain-water equipment. Even a trace of soap on the plain coin changes the result.

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Run the lesson

A dome of water raises the question. Three rounds on two coins give the evidence.

Introduce the phenomenon 5 MINUTES

DO Place a dry coin on a level surface where the class can see it. Slowly add drops of plain water. Pause while a dome is visible.

ASK "What shape is the water making? Why hasn't it spilled yet?"

Predict and plan 7 MINUTES

DO Show the two liquids. Children write a prediction on the student page.

ASK

- "Will adding soap change the number of drops the coin can hold?"
- "What must stay the same so we can compare the two liquids?"

Establish the coin type, the coin side, the dropper height and the drop size as far as possible. Read the dropping rule together.

Run the first comparison 12 MINUTES

DO Pairs follow the dropping rule with plain water on the first coin and record the count. They repeat on the second coin with the soapy water and its own dropper.

ASK "What do you notice about the shape of the water just before it spills?"

Repeat 13 MINUTES

DO Pairs complete three rounds for each liquid. They dry or rinse the coins between rounds as set out on page 3, and they swap the dropping and counting roles.

Compare results 12 MINUTES

DO Collect each pair's counts on the board in two columns, plain and soapy.

ASK

- "Which liquid usually stayed on the coin for more drops?"
- "Did the water's shape look different?"
- "Why did the numbers vary between rounds? Did every pair find the same pattern?"

Explain that counting drops is a practical classroom comparison. Drops are not perfectly equal measures of volume, which is one reason the counts vary.

Close 6 MINUTES

DO Children draw the two water shapes and complete the sentences. "Our results showed ___. The counts that support our answer are ___. We noticed this about the water's shape: ___." Allow a few minutes for cleanup within this stage.

LOOK FOR

Children who use the word "usually" and quote their counts. A claim such as "plain water held 24, 27 and 22, and soapy held 11, 9 and 12" uses all the evidence.

IF THIS HAPPENS

The plain water spills after only a few drops. The coin may be greasy or carry a trace of soap. Wash it, rinse it well and dry it.

The dropper touches the dome. The water usually spills early. Children mark the round "dropper touched water" and repeat it. They keep the note, so they can explain why that round was repeated.

The two liquids give similar counts. Check that soap has not reached the plain cup or dropper. If the equipment is clean, record the result as it is.

LEVEL SURFACE

A coin on a slope spills early. Check that the tray sits flat on the table.

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The science behind it

Why water piles up, what soap does to it and how to adjust the investigation.

The science behind it

Water is made of tiny particles called molecules, and water molecules attract one another. Inside a drop, each molecule is pulled equally in every direction. At the surface there are no water molecules above, so the surface molecules are pulled sideways and inward. This makes the surface behave like a stretched skin. Scientists call it surface tension.

Surface tension holds the water together as it piles up, so it forms a dome that bulges past the edge of the coin before it spills. Dish soap gets between the water molecules at the surface and weakens the pull between them. With lower surface tension the water spreads out and spills sooner, so a coin usually holds fewer drops of soapy water than plain water.

The counts will not be the same in every round. Drops differ a little in size, and a small bump or a tilted coin can end a round early. That is why the class compares three rounds and looks for what usually happens.

Ideas children often bring

A CHILD MIGHT SAY	YOU COULD RESPOND
“The coin has a rim that holds the water in.”	Look from the side. The dome rises well above the rim and bulges past it.
“Soap makes water heavier.”	The soap changes how strongly the water holds together at its surface.
“We got 25 once, so the coin holds 25.”	Ask what the other rounds showed and which word describes all three.

Support and challenge

Support. One child drops while the other makes a tally mark for each drop, so nobody loses count.

Challenge. Ask children to find the middle count for each liquid and compare those two numbers across the class.

ASSESSMENT

Use the student page and the discussion.

Fair test: names what was kept the same.

Data: records three counts for each liquid.

Conclusion: states what the results showed, whether that is a clear difference, similar counts or a mixed picture, and supports it with the counts.

TAKE IT FURTHER

A different coin. Predict and test whether a larger coin holds more drops.

The other side. Compare the two faces of the same coin.

More soap. Test a batch with twice as much soap.

FINAL EXPLANATION

Ask every pair for the same three things. Tell us what you found, show the evidence, and explain what you think caused it.

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A mountain of water

Does adding soap change how many drops a coin can hold?

Name _____ **Date** _____

1 My prediction

I think the coin will hold more drops of **plain water** **soapy water** **the same**

because

_____

2 Our fair test

What will we keep the same?

_____

3 Our results

Count the drops until the water first spills. Write the number the coin held before the drop that made it spill.

LIQUID	ROUND 1	ROUND 2	ROUND 3
Plain water			
Soapy water			

4 Draw the water from the side

Show the shape just before it spilled.

Plain water

Soapy water

5 What we found

Our results showed

_____

The counts that support our answer are

_____

We noticed this about the water's shape:

_____

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