GIVE SPARK



GIVE SPARK · HANDS-ON SCIENCE LAB

The Sugar Disappearing Act

Does crushed sugar dissolve faster than a whole sugar cube?

Teacher Guide

Grades 3–5 · Properties of matter · 55 minutes

FREE LAB

OVERVIEW

The lab at a glance

One lesson, one driving question and a test that depends on agreeing what to look for.

THE DRIVING QUESTION

Does crushed sugar dissolve faster than a whole sugar cube?

Children predict first, then time a whole cube and a crushed cube side by side.

What children do

Pairs agree on what “dissolved” will mean in their test. They put one whole sugar cube in a cup of water and one crushed cube in a second cup, at the same moment and without stirring. They time how long each takes to dissolve, repeat the test and then explain what their observations can show and what they cannot.

What children learn

Sugar can disappear from view without disappearing from the water. Dissolving happens where the sugar touches the water, so the same amount of sugar in smaller pieces has more surface for the water to reach. Children find out from their own times whether that changes how fast it dissolves. They also learn that an investigation answers the question it was built for and leaves other questions open.

Success looks like

1. I kept the amount of sugar, the amount of water and its temperature the same, and I did not stir.
2. I used our agreed meaning of “dissolved” to decide when to stop the timer.
3. I said what my results show and named one thing they cannot show.

The fair test

WE CHANGE	WE MEASURE	WE KEEP THE SAME
Whether the cube is whole or crushed	The time until no solid sugar can be seen	One cube of sugar, 100 mL of water, the water temperature, the cup, and no stirring or bumping

AT A GLANCE

Time: 55 minutes.

Grouping: pairs.

Standards link: supports NGSS 5-PS1-1, developing the idea that matter is made of particles too small to be seen.

SESSION PLAN

STAGE	MIN
Introduce the puzzle	5
Agree and plan	8
Round one	12
Round two	12
Compare results	10
Close	8
Total	**55**

THE STUDENT RESOURCE

A separate one-page PDF with the prediction, the agreed meaning of “dissolved”, the results table and the closing explanation.

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PREPARATION

Get ready

What to gather, how to crush a cube and how to run a round.

Materials

For each pair

- 4 sugar cubes of the same size
- 2 identical clear cups
- A measuring cup marked in mL
- A small zip bag and a spoon for crushing
- A timer
- A sheet of dark paper to stand behind the cups
- The student page and a pencil

For you

- A pitcher of water that has stood in the room for an hour, so every pair uses water at the same temperature
- A bucket for used water
- One spare cup and one spare cube for the opening

How to crush a cube

1. Seal one sugar cube inside the zip bag.
2. Press on it with the back of the spoon until no lumps are left.
3. Keep the crushed sugar in the bag until both cups are ready. Add it on the starting signal, and check that none is left in the bag.

How to run a round

1. Measure 100 mL of water into each cup and stand the cups in front of the dark paper.
2. On a count of three, one partner drops in the whole cube and the other tips in the crushed cube.
3. Start the timer at that moment. Do not stir, shake or move the cups.
4. Keep one timer running. Look through the side of each cup and record the time on the timer when each cup meets your meaning of “dissolved”. Do not stop the timer when the first cup finishes.
5. If sugar can still be seen after 10 minutes, record “more than 10 minutes” for that cup.

For round two, pairs empty both cups, rinse them and start again with fresh water and two new cubes.



Two cups filled to the same level, whole cubes, and one cube crushed in a zip bag.

SAFETY

Nobody tastes the water or eats the sugar. The cups and cubes have been handled.

WHY NO STIRRING

Stirring speeds dissolving a great deal, and no two children stir the same way. Leaving both cups still keeps the comparison between whole and crushed.

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TEACHING SEQUENCE

Run the lesson

A vanishing sugar cube raises the question. Two cups, one timer and an agreed finish answer it.

Introduce the puzzle 5 MINUTES

DO Drop a sugar cube into a clear cup of water where everyone can see it. Give the class a quiet minute to watch the edges of the cube.

ASK “What is happening to the sugar? Where is it going?”

Agree and plan 8 MINUTES

ASK “If we want to time this, how will we know when the sugar has dissolved?”

DO Take suggestions and settle on one meaning for the class, such as “We can no longer see any solid sugar when we look through the side of the cup.” Children write it on the student page. Then they record a prediction and fill in the fair test.

Round one 12 MINUTES

DO Pairs crush one cube, then run a round with the steps on page 3. While they wait, they watch closely and note what they see in each cup.

ASK “What do you notice in the water just above the sugar?”

Round two 12 MINUTES

DO Pairs rinse the cups and repeat with fresh water and two new cubes. They swap who handles the whole cube and who handles the crushed one.

Compare results 10 MINUTES

DO Collect each pair’s times on the board in two columns, whole and crushed.

ASK

- “Which usually dissolved sooner? Did every pair find the same thing?”
- “Why might two pairs get different times for the same test?”
- “The sugar has gone from view. Is it still in the cup? How could we find out?”

Close 8 MINUTES

DO Children complete the student page. “Our results showed ___. The times that support our answer are ___. Our results cannot show ___.” Allow a few minutes for cleanup within this stage.

LOOK FOR

Children who separate what they saw from what they think is happening. “The crushed sugar could not be seen after 3 minutes” is an observation. “It broke into tiny pieces” is an explanation.

IF THIS HAPPENS

Neither cup finishes in 10 minutes. Children record “more than 10 minutes” for both. That round cannot show which dissolved first. They can describe how much sugar is left in each cup as an observation, which is not the same as a measured time.

Partners disagree about when to stop. Go back to the agreed meaning and look through the side of the cup together.

The two times are close. That is a result. Ask what the class results show.

IS THE SUGAR STILL THERE?

Pour a little of the sugar water into a saucer and leave it on a windowsill. In a few days the water has gone and sugar crystals are left behind.

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The science behind it

What dissolving is, why surface matters and what this test can and cannot tell you.

The science behind it

Sugar is made of particles far too small to see. When sugar meets water, water particles pull sugar particles away from the surface of the solid and carry them off into the water. The sugar has dissolved. It is still there, spread through the water in pieces too small to see.

Dissolving can only happen at the surface, where sugar and water touch. A sugar cube is made of sugar crystals packed tightly together. Crushing separates the packed crystals and can expose more surface to the water, so more of the sugar meets the water at once and it usually dissolves faster.

In a still cup, the water right next to the sugar soon holds a lot of dissolved sugar, and that slows things down. This is why an unstirred cube can take several minutes, and why the shimmering streams above the sugar are worth pointing out.

What the results can and cannot show

THE RESULTS CAN SHOW	THE RESULTS CANNOT SHOW
Which form of sugar disappeared from view sooner in this test	That the sugar has gone. It can no longer be seen, which is a different claim.
Whether the pattern repeated across two rounds and across the class	Why one was faster. The explanation about surface comes from the science, and the test supports it.
How much the times varied	What would happen with stirring, warmer water or a different amount of sugar

Support and challenge

Support. Run both rounds as a comparison by eye. Children record which cup finished first and what they saw.

Challenge. Ask children to predict the result for a cube broken into four pieces, and to explain where their prediction comes from.

ASSESSMENT

Use the student page and the discussion.

Fair test: names what was kept the same, including no stirring.

Data: records times for both rounds.

Limits: names one thing the results cannot show.

IDEAS CHILDREN OFTEN BRING

“The sugar melted.” Melting changes a solid into a liquid. Here, sugar dissolves in water. It does not become liquid sugar.

“The sugar is gone.” Set up the saucer and look again in a few days.

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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Vicky Brooks
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The sugar disappearing act

Does crushed sugar dissolve faster than a whole sugar cube?

Name _____ **Date** _____

1 My prediction

I think the sugar that dissolves sooner will be **the whole cube** / **the crushed cube** / **about the same**

because

_____

2 What "dissolved" means in our test

We stop the timer for a cup when

_____

3 Our fair test

What will we keep the same?

_____

4 Our results

Start both cups at the same moment. Do not stir. If you can still see sugar after 10 minutes, write "more than 10 minutes".

SUGAR	ROUND 1 TIME (MIN:SEC)	ROUND 2 TIME (MIN:SEC)	WHAT DID WE SEE IN THE CUP?
Whole cube			
Crushed cube			

5 What we found

Our results showed

_____

The times that support our answer are

_____

Our results cannot show

_____

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