

materials

Testing a property fairly: which is the most absorbent?

Lesson at a glance

Open with a small spill and dab paper towel then tea towel, asking which soaks more and how to compare fairly. Pupils predict which of four same-size materials (paper towel, cotton, felt, nylon) will hold most water, then commit Change and Measure silently on the Investigation Journal before checking against the fair-test-planner interactive. After a whole-class syringe model (10 ml offered, 30 s wait, tip-and-draw free water), groups run two dry trials per material, average ml held, and pool class figures into a bar chart on the data-recorder interactive. Close by naming what kept the test fair.

Learning objectives

- Plan a fair test by naming what to change, what to measure and what to keep the same
- Compare absorbency of materials using the same method, repeats and an average
- Explain what would make the absorbency test unfair

Before the bell: prep

Night before, cut four materials (paper towel, cotton, felt, nylon) into identical squares (e.g. 10 cm): two dry pieces per material per group, plus spares. One marked syringe and shallow tray per group; jug of water; timers. If syringes are short, agree teaspoons held for the whole class only, never mix units.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
paper towel pieces (same size, about 10 cm square)	3	group	classroom	kitchen roll squares brought from home
cotton fabric samples (same size as paper pieces)	3	group	classroom	cotton scraps from home, all cut to the same size
felt fabric samples (same size as paper pieces)	3	group	classroom	felt scraps from home or craft offcuts, all cut to the same size
nylon fabric samples (same size as paper pieces)	3	group	classroom	nylon or waterproof fabric scraps from home, all cut to the same size
jug of water	1	group	classroom	a large bottle of water per group
plastic syringe or dropper marked in ml	1	group	school kit	a teaspoon used with careful counting (whole class only; record teaspoons held, not ml)
shallow tray or dish	1	group	classroom	a clean plastic takeaway lid or deep plate
kitchen or balance scales (optional: only if the whole class has agreed the mass-gain method; omit for the preferred syringe leftover method)		group	school kit	skip weighing; measure ml offered minus ml left free on the tray (preferred class method)
stopwatch or timer	1	group	classroom	the classroom clock or teacher's phone timer called aloud
cloths for wiping spills	2	class	classroom	extra paper towel kept only for clean-up
paper towel and tea towel for the hook demo	1	class	classroom	any two different absorbent cloths

Safety watch-point

Wipe spills as they happen; walk, do not run, with water; keep water away from devices and electrical sockets.

Teaching moves

- **Getting Started:** Show only a jug, one paper towel and one tea towel. Dab a small spill with each. Take two or three quick fairness ideas (same size, same water, same time) without correcting every answer: curiosity first; precise planning comes next.
- **Question and Predict:** Lay out the four dry same-size pieces. Partners whisper which will hold most and why. Note one or two pupil reasons on the board; do not reveal which material is expected to win.
- **Commit your plan, then check it:** Open the fair-test-planner but do not touch a card for two silent minutes while each pupil writes Change and Measure alone on the Investigation Journal. Then place the cards together. Hands for who had Change right, then Measure. Draw out the common error of parking 'how much water it holds' under Keep the same. If you keep the thing you measure fixed, there is nothing left to find out. Ask one pupil who changed their mind what shifted it.
- **Model the Method:** Five minutes watching only: one material (cotton). Think aloud: wonder, predict ~6 ml, offer exactly 10 ml, wait 30 s, tip free water to a corner, draw back into the syringe, ml held = 10 – ml free. Say two trial numbers and the average aloud; pupils do not copy demo readings. Leave method numbers and tip-and-draw on the board. Agree one class method for every group.
- **Run the Absorbency Test:** Groups run the board method: same-size dry piece, 10 ml, 30 s, tip-and-draw, two trials per material, record live on their own Investigation Journal page. Walk the room: stop and recut if pieces differ in size; move pooling water to a shallow dish; if two materials both take all 10 ml, offer a little more and re-run only those two with size, time and method identical. If the clock is tight, finish two materials thoroughly and pool class data rather than rush eight sloppy trials.
- **Check and Average Results:** Numbers should already be on the page: this beat is averages and ranking only. Check two readings per material, $\text{sum} \div 2$, units as ml (or teaspoons held). Send any one-reading group back for a second dry piece before they rank.
- **Make Sense of the Data:** Open the data-recorder interactive: Material and Average water held (ml). Collect one class figure per material, show the bar chart. Prompt: tallest bar vs group rankings; prediction vs evidence; change / measure / keep-the-same; what would make it unfair (different sizes, water amounts, wait times, squeezing harder, reusing a wet piece). Optional one-liner: paper towel's tiny spaces hold water. Keep the talk display-only.
- **Reflect and Tidy:** Three or four voices on what made the test fair and one unfair move. Oral exit check: What did we change? What did we measure? Name one keep-the-same. Empty trays, dry tables, return syringes, bag damp fabrics.

**What it should show**

Expect paper towel and cotton to hold more water than nylon; felt varies with thickness. Exact ml matter less than a clear fair ranking. Odd results usually mean unequal piece sizes, a wet piece reused as a 'dry' trial, free water left undrawn on the tray, or both materials hitting the 10 ml ceiling: recut, use a fresh dry piece, recover all free water, or offer a little more water and re-run only the tied pair with method identical.

**Misconceptions & interventions**

- **Pupils put 'how much water it holds' under Keep the same, so nothing is left to compare.** On the fair-test-planner, point: Change is the material; Measure is water held. If you freeze the thing you measure, the test cannot answer the question.
- **'One reading is enough: averaging is just extra maths.'** Hold up two dry-piece readings that differ (e.g. 5 ml and 7 ml). Show the average as the sensible single figure and send them for a second dry trial before ranking.
- **Pupils think a bigger piece or squeezing harder is fine because 'it's the same material'.** Stop the group and recut to matching squares. Revoice: size, water offered, wait time and handling must stay the same or the ranking is about setup, not absorbency.

**Differentiation**

Emerging	Developing	Proficient
• Pair with a confident calculator for averages; allow pointing to Change/Measure cards before writing; teacher table models one full trial with the syringe before independent runs.	• If two readings differ a lot, run a third dry piece and say which keep-the-same they tightened; prompt how much more the top material held than the bottom.	• Critique a neighbour group's method for one unfair move without new kit; link ranking to a real job (mopping spills vs a raincoat) using observation vs inference.

**Cross-curricular hook**

Tie to Maths Data and Measures: pupils average repeat readings in ml and read the class bar chart's tallest bar and range.

