Lesson 9

materials

Choosing the right material for the job

Lesson at a glance

Open with a raincoat puzzle: it must keep rain out yet let sweat escape — can one material do both? Each group gets an object brief card (raincoat, lunchbox or school-bag strap) with two competing jobs, then tests four materials (cotton, plastic sheet, foil, card) against both properties, scoring each 1–3. The recorder puts one group's scores side by side on the IWB as a worked example. Groups then defend a recommendation and name what they traded away, recording it on their Investigation Journal page.

Learning objectives

- Test the same materials against two properties that pull against each other
- Recommend a material for your group's object and justify the choice from your own scores
- Explain what you traded away, and why another group's object needed a different material

Before the bell — prep

Print and cut the three object brief cards before the bell — one per group. Set out a tray per group: cotton fabric, a plastic sheet cut from a clear document wallet, foil and card, all in same-size pieces. Add a small cup of water and one 100 g weight for the lunchbox groups. Have a real raincoat to hand (or point at the coat hooks).

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Item	Qty	Per	Source	Low-cost substitute
fabric sample (cotton scrap, roughly 10 cm square)	4	group	brought from home	an old tea towel or T-shirt cut into squares
plastic sheet sample (cut from a clear document wallet, roughly 10 cm square)	4	group	classroom	cut from an empty clear water bottle
kitchen foil square (roughly 10 cm square)	4	group	supermarket	foil from a clean food wrapper
card square (roughly 10 cm square)	4	group	classroom	cereal-box card
water in a jug	1	group	classroom	any clean container
syringe or dropper	1	group	school kit	a teaspoon counted out
small weights for strength and rigidity testing (e.g. 100 g masses)	2	group	school kit	a small stone or a full glue stick
object brief cards (raincoat, lunchbox, school-bag strap)	1	group	provided printable	write the object, its two jobs and their test methods on the board

Safety watch-point

Keep water cups small and off the edge of desks to avoid slips; wipe spills straight away. Remind pupils to breathe gently through materials, not to put foil or plastic to the mouth.

Teaching moves

- **Two jobs that pull against each other:** Hand each group ONE brief card and read the two jobs aloud with them. Stress that both jobs must be tested — children will want to score only the obvious one. Share the breathable-hillwalking-jacket fact as a wonder moment, not a fourth test.
- **Test four materials, two ways:** Model one full cycle on the raincoat brief first — think aloud: predict foil, drip water, breathe through it, score 3 for rain-out and 1 for sweat. Then release groups. Walk the room and check pieces are the same size, the same amount of water is dripped, and the same weight is rested — that's the fair comparison. Take each score by group agreement, not one child's shout.
- **Put the scores side by side:** Drive this as ONE worked example on the IWB, not a class pool. Type in one group's four materials with both score columns so all can see the pattern: the material topping one column usually drops in the other. Use the one-click chart on job 2, then ask 'is any bar tall in both columns?'
- **Defend it and get challenged:** Each group names its recommended material and what it gave up. Push listeners to challenge: 'would a lunchbox group have picked the same material? Why did their object need something different?' Draw out that foil is a poor raincoat but a fine lunch-wrap — the job decides the material.

What it should show

Expect no single material to top both columns. For the raincoat, plastic sheet or foil keeps rain out (score 3) but blocks sweat (score 1), while cotton breathes but leaks — so the group must choose and name the cost. If a group scores one material high on both, they've likely tested only one property or measured unfairly; send them back to run the second test.

Misconceptions & interventions

- **"There must be one best material that wins both jobs."** — Point at the side-by-side scores on the IWB and trace the top-of-column-one material down to its low score in column two. Ask them to find any material that's high in both — there isn't one. That's the trade-off.
- **"Foil is a bad material because it failed the raincoat test."** — In the defend step, hand the foil to a lunchbox or wrap discussion: foil is poor at letting sweat escape but excellent at keeping food fresh. The right material depends on the object's job, not on winning every test.

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Differentiation

Emerging	Developing	Proficient
• Give this group the raincoat card only and pair them at the teacher table for the first material, scoring it together before they carry on. • Pre-fill the Material column on their Journal page so they just add the two scores.	• Ask 'which of your four materials was the closest all-rounder, and why?' before they recommend. • Have them run a second trial on their strongest and weakest material to check the score holds.	• Ask them to critique whether the test was truly fair — same water, same-size pieces — and name one thing to tighten. • Set the challenge: design a two-layer solution using two of the tray materials that beats the trade-off.

Cross-curricular hook

Link to the Maths Data strand — pupils read the IWB bar chart of scores and compare columns to spot which material tops each job.