

materials

Keeping the heat in

Lesson at a glance

Open with a thin scrap versus thick wool and ask which would keep a warm drink warmer on a cold Irish morning. Pupils place the five variable cards on the fair-test-planner interactive, then wrap identical cups in wool, foil, paper, bubble wrap or leave one bare. Teacher pours the same warm water into each; after a shared wait, groups unwrap and rank warmth on a 1–5 hand-feel scale. Results go into the data-recorder bar chart and the Investigation Journal, then a talk links the best insulator to jackets and lagged hot-water cylinders.

Learning objectives

- Plan a fair test of which wrapping keeps warm water warm longest
- Record which materials keep warmth in better
- Link the results to everyday Irish uses such as jackets and hot-water cylinders

Before the bell – prep

Day before: five identical cups per group, pre-mark a fill line on each, pre-cut wool, foil, paper and bubble-wrap pieces, label cup bases W/F/P/B/X. Elastic bands or tape strips ready. One jug of hand-warm (never hot) water for teacher-only pouring. Optional: classroom thermometers only if you lock that method before the lesson.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
identical clear plastic cups	5	group	classroom	identical clean yoghurt pots
trays to hold each group's cups	1	group	classroom	a sturdy cardboard box lid or baking tray from home
wool fabric scraps or cut pieces from an old sock	1	group	brought from home	a thick glove or fleece scrap
aluminium foil sheets	1	group	supermarket	clean foil from a food tray, flattened
paper wrap (newspaper or kitchen paper)	1	group	classroom	a page of scrap paper
bubble wrap pieces	1	group	classroom	a puffy padded envelope cut open
elastic bands or sticky tape strips to fasten wraps	4	group	classroom	string or a rubber hair band per wrap
jug of warm (hand-safe) water for teacher pouring	1	class	classroom	water from a warm tap, checked by the teacher
class timer or stopwatch	1	class	school kit	classroom clock with a second hand or minute hand
classroom thermometers	1	group	school kit	no thermometer: one agreed pupil judges every cup by hand after unwrapping (same judge, same hand, same order)
cloths or paper towels for spills	4	class	classroom	scrap cloth from home
Investigation Journal pages	2	pupil	provided printable	plain paper ruled for a fair-test plan and a simple results table

Safety watch-point

Teacher only pours hand-warm water — never hot. No tasting; wipe spills at once; walk, do not run, near cups; empty into sink at tidy.



Teaching moves

- **Heat keepers and heat leavers:** Name heat insulator first with the wool jumper idea, then briefly the metal-spoon conductor as the useful opposite. Keep activity language on which wraps keep warmth in. Flag that foil is metal and may lose heat faster than wool if it traps little air — let the evidence decide later.
- **Question and predict:** Write the exact question on the board and keep the five wraps visible. Take three or four partner predictions with the stem 'I think ... will stay warmest because ...'. If a pupil only names a material, push for thickness, fluffiness or trapped air.
- **Plan our fair test:** Open the fair-test-planner interactive and lock Change = wrapping, Measure = how warm the water stays, Keep the same = cup, amount of water, wait time. When you place amount of water, say every cup is filled from the same jug to the same mark so start warmth matches. Pupils copy the plan onto the Investigation Journal page.
- **Wrap and wait:** Groups wrap first with no water. You pour every cup to the fill line from one jug, then start one class timer. During the wait, talk jackets, attic lagging and hot-water cylinders. After the wait, insist groups unwrap before sensing: same judge, same hand, 5 = still very warm to 1 = room temperature on the cup wall, not the jacket outside.
- **Record our results:** Enter class results in the data-recorder with columns Wrapping and Warmth left (1–5) — or Temperature (°C) only if you locked thermometers earlier. Never show both headers. When groups disagree, take a middle or most-common rank and say so. Show the bar chart and ask which bar is highest.
- **What does the evidence show?:** Point at the tallest and shortest bars. Partner sentence: one material that kept warmth in well and one everyday place (jacket, blanket, hot-water cylinder). Revoice better insulator versus poorer wrap; reserve 'heat conductor' for clear metal cases. Quick fairness check: different water, wait, cups or start warmth would break the test.



What it should show

Expect wool and bubble wrap to rank warmest (more trapped air) and bare plus thin paper coolest. Foil often sits mid-table or cools faster when wrapped tight with little air — treat that as useful data, not a failed test. A group whose wool cup feels coldest usually judged the outside of the wrap; re-run the feel on the unwrapped cup wall.



Misconceptions & interventions

- **'Foil will win because it looks shiny and scientific.'** — Remind them foil is metal and may act more like a conductor if little air is trapped. After ranking, point at the foil bar and ask whether the evidence matched the shiny guess.
- **Pupils touch the outside of the wool or bubble wrap and say that cup is coldest.** — Stop and revoice: a good insulator often feels cooler outside while the water inside stays warmer. Unwrap, then feel the cup wall with the same judge.
- **'The material is magic — warmth just stays in.'** — Name it simply: some materials slow heat leaving; some let it leave faster. Point back to trapped air and thickness in the woollen jumper example.



**Differentiation**

Emerging	Developing	Proficient
• Pair at the teacher table for wrapping and fastening; give a partly labelled journal row with the five wrap names already written so they only add the 1–5 score. • Act as the agreed group judge with the teacher modelling the cup-wall feel once before they rank.	• After recording, add one ‘why?’ note beside the warmest wrap (thickness, fluffiness or trapped air). • Help choose the shared wait time and the order the group will check cups.	• Critique fairness: name one change that would have made today’s test unfair and how the class prevented it. • Stretch link: explain why attic lagging or a lagged hot-water cylinder uses the same insulator idea as the winning wrap.

Cross-curricular hook

Tie to Maths Data — build the class bar chart of warmth ranks and read which wrap was the mode (highest bar).