

materials

Clean the dirty water: apply it

Lesson at a glance

Hold up a jar of muddy water and ask whether anyone would want it from a tap. After looking filter, filter design and water treatment in plain language, pupils sort five cards on the fair-test-planner interactive so design is the only change and clearness (1-5) is what they measure. Groups build a multi-layer bottle filter from cotton wool, sand, gravel and optional filter paper, pour the same measured muddy water, score clearness, then line cups up for class evidence before recording design, score and conclusion in the Investigation Journal.

Learning objectives

- Design and build a multi-layer filter from everyday materials
- Fair-test which filter design cleans muddy water best
- Connect the challenge to water treatment and clean water as a real issue in Ireland

Before the bell – prep

Adult-cut one bottle per group the day before. Wash and dry sand and gravel. Pre-mix one closed jug of muddy water and trial a pour so you know the shared wait time. Set trays, collection cups, spoons, sticky notes and a stability support (jug, cut bottle base or tray hole) at each table.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
clear plastic bottle with base removed (adult-cut)	1	group	brought from home	large clear cup with holes punched in the base by an adult
stability support for inverted bottle (jug, spare cut bottle base, or tray with cut-out hole)	1	group	classroom	a second cup or small tub the bottle can sit inside
clear collection cup or beaker	1	group	classroom	clean glass jam jar
cotton wool	1	group	supermarket	piece of clean cloth or kitchen paper
washed sand	1	group	hardware shop	clean play sand from the school sand tray
washed gravel or small stones	1	group	hardware shop	rinsed aquarium gravel or small clean pebbles
filter paper	1	group	school kit	circle of kitchen roll
muddy water (soil stirred into water in a jug)	1	class	outdoors	water mixed with a little cocoa powder for a less gritty mess (still never tasted)
measuring cup or small cup with a fill mark	1	group	classroom	identical yoghurt pots filled to the rim
tray or newspaper for spills	1	group	classroom	old plastic bag opened flat
spoons for placing layers	2	group	classroom	clean hands for dry materials only
sticky notes for labelling layer order and scores	2	group	classroom	small scrap paper and tape

Safety watch-point

Only adults cut bottles. Never taste, drink or put filtered water near mouths. Mop spills at once; wash hands after muddy water and sand.



Teaching moves

- **How a filter cleans water:** Give one short spoken definition each for filter, filter design and water treatment, then run the thirty-second turn-and-talk on which layer should sit at the bottom. Say clearly before anyone builds: classroom-filtered water is never tasted or drunk.
- **Plan the fair filter test:** Open the fair-test-planner interactive and drag filter design to Change, how clear the water is to Measure, and amount, bottle size and wait time to Keep the same—invite hands-up before each drag. Lock the shared 1–5 clearness scale on the board for the rest of the lesson; do not drop that lock-in for longer predictions.
- **Build your filter:** Model for two minutes only: bottle neck-down over a cup in its support, thin cotton-wool base, sand layer, sticky-note label. Circulate asking why that order; loosen packed cotton if nothing drips, or add a cotton base if sand falls straight through.
- **Test which filter cleans best:** Stir the class jug, give every group the same measured pour on one signal, and run one fixed countdown from your pre-lesson trial. Scores go on the bottle sticky at once, then one runner per group lines cups from muddiest to clearest so step 6 has shared evidence.
- **Record results and conclusion:** On the Investigation Journal page only, have pupils record layer order, clearness score, one observation, and one evidence-linked conclusion from the cup line-up. Push observation-versus-inference with stems such as ‘Our water looked...’ then ‘So we think...’.
- **Make sense: filters and real water:** Point at cups and scores, name what the clearest designs shared, and link the bottle to filtration at an Irish treatment works. Revoice that clear is not drinkable—real treatment uses more steps and testing.



What it should show

Multi-layer designs with a fine layer (cotton wool or filter paper), often under sand, usually score clearer than gravel-only or single coarse layers. A blocked filter is valid data—note ‘no flow’ and score what collected. Odd muddy scores often mean uneven pours, a different wait, or layers packed so tight almost nothing passed.



Misconceptions & interventions

- **‘Our water looks clear, so it must be safe to drink.’** — Hold up a high-scoring cup and revoice: our filters only trap some visible mud. Real Irish treatment uses more steps and careful testing—say again, we never taste ours.
- **Pupils change pour amount, wait time or bottle set-up between groups and still call it a fair test.** — Point back at the fair-test-planner sort: only filter design changes. Ask ‘What would make this unfair?’ and restate same measure, same wait, same clearness scale.
- **‘Gravel alone will clean the water because the holes will catch the mud.’** — Compare a gravel-only cup with a fine-layer design in the line-up. Ask which bits got through and what a bottom cotton or paper layer is for.



**Differentiation**

Emerging	Developing	Proficient
• Start them on cotton wool, then sand, then gravel, and offer sentence stems for design, score and one thing they saw. • Stay at the teacher table for the pour and clearness score so the sticky note is filled before the line-up.	• Ask why that bottom layer, and have them note flow as free, slow or blocked beside the clearness score.	• Stretch design choice (finer bottom layer, different order, or optional paper) still with one bottle and the same pour. • Fast finishers sketch an improved layer order on the same journal page and say how they would keep a re-test fair.

Cross-curricular hook

Link to Geography and local place: where nearby lake, river or reservoir water is treated before it reaches school taps.