

Lesson 33 · engineering

Choosing materials for a build

Lesson at a glance

Open by holding up fabric versus plastic and asking which matters more for a school-garden shelter roof: looking smart or staying dry. Pupils name the properties the brief needs, agree fair-test controls, then run water, bend and load tests on plastic, foil, card and fabric. Results land on the Investigation Journal page; groups choose a roof, a side or base, and one reject, each justified from their evidence, then share.

Learning objectives

- Test candidate materials against the properties a design brief needs
- Choose materials for a build and justify each choice from property evidence

Before the bell – prep

Print the Investigation Journal page. Per group: tray with plastic sheet, foil, card and fabric (paper aside for extension only); shallow tray with ~2 cm water; identical washers or coins. Mark a shared ~6 cm book gap for the load test so every group uses the same span.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
plastic sheet samples (about 10 cm square)	1	group	classroom	cut-up clean plastic wallet or food bag
aluminium foil samples (about 10 cm square)	1	group	supermarket	foil from clean food trays, flattened
card samples (about 10 cm square)	1	group	classroom	cereal-box card
cotton fabric samples (about 10 cm square)	1	group	brought from home	clean old tea-towel scraps
paper samples (about 10 cm square) — extension only	1	group	classroom	scrap printer paper
shallow water tray	1	group	classroom	clean takeaway tray or baking tin
plastic dropper or teaspoon	1	group	school kit	teaspoon counted out the same way each time
identical metal washers or 1 cent / 2 cent coins	20	group	hardware shop	identical interlocking cubes or marbles counted out
hardback books to use as load-test supports	2	group	classroom	two identical wood blocks or pencil cases of equal height
cloths or paper towels for spills	2	group	classroom	scrap cloths from home
Investigation Journal page	1	pupil	classroom	—

Safety watch-point

No tasting materials. Wipe spills at once and keep washers off the floor trip zone; mind wet floors around water trays.

Teaching moves

- **What the brief needs:** Project only the short board brief. Invite the class to name properties the shelter needs — waterproof, stiff enough to stand, easy to cut and join. Push past ‘looks nice’ choices back to the brief. Do not lock the three test methods yet.
- **Keep the tests fair:** Map class property ideas onto the three tests: stay dry → water; hold shape → bend and load. Agree controls aloud: same sample size, same three drops or one teaspoon, same washers, same ~6 cm gap. Pupils jot oral predictions for driest and strongest on the Investigation Journal page only.
- **Test the materials:** Model one full cycle on one sample first. Call the order: water all → bend all → load all. Walk the room for uneven drop counts or groups inventing their own load span. At about 12 minutes, if slow, finish water and load on three materials so Step 5 still has roof evidence.
- **Record your choices:** Keep pupils on the same Investigation Journal page. Complete missing result cells first, then roof, side-or-base and reject with a short evidence why. If a group picks soft fabric for the roof, ask them to re-read their water results rather than correcting them.
- **Share and justify:** Take three or four group shares. Ask listeners: do you agree with their roof choice, and what evidence would change your mind? Draw out that a material can be strong and still useless if it soaks, and that evidence beats ‘I just like this one’.

What it should show

Plastic sheet or foil usually wins the water test; fabric soaks or lets water through. Card often holds shape and load better than soft fabric; thin foil may tear under load sooner than card. A group whose fabric ‘stays dry’ likely used too few drops or held the sample flat so water never had a path through — re-run over the tray with the same three drops.

Misconceptions & interventions

- **Pupils pick the material they like the look of, not the one the brief needs.** — Hold the brief up again and ask which property the roof job actually needs. Send them back to their water-test row before they lock a choice.
- **‘If it’s strong it must be good for the whole shelter, including the roof.’** — Point at a fabric or card sample that held load but soaked in the water test. Ask: would seed trays stay dry under that roof?
- **Groups change drop count or load-gap between samples and still call the comparison fair.** — Stop the class and re-voice ‘what must stay the same?’ Restate the shared three-drop count and the marked book gap before they continue.

**Differentiation**

Emerging	Developing	Proficient
• Test three materials only, still in water → bend → load order, with an adult helping hold samples over the tray and prompting each journal cell.	• After the four samples, add a quick join note on the same page (e.g. 'easy to join with tape') linked to the brief's cut-and-join need.	• Add the paper sample as a fifth material, or critique another group's roof choice: would their evidence still hold in driving Irish rain?

**Cross-curricular hook**

Link to Maths measures — same sample span, same drop volume, and counting washers as a fair load scale.

