

A local problem: define and design

Lesson at a glance

Open with a familiar school annoyance and ask who it bothers and what “fixed” would look like. Model user need, three testable success criteria and a rough labelled sketch on the board using a marker-ledge problem not on the pupil cards. Groups pick one of four school-problem cards, pin down user and criteria on scrap paper, then transfer everything onto one Investigation Journal Design Brief and sketch a junk-kit build. Peer swap tightens one criterion or label before briefs are stored for the build session.

Learning objectives

- Define a real school problem in terms of user need and clear success criteria
- Sketch a buildable solution on a Design Brief that a group can follow next

Before the bell: prep

Print one set of the four problem cards per group and one Investigation Journal Design Brief page per group. Have clipboards, scrap paper, pencils and rulers ready. Do not set out junk-modelling kit today: groups only plan with it. Clear a folder or tray space so finished briefs stay safe for the next two sessions.

Materials

Item	Qty	Per	Source	Low-cost substitute
Investigation Journal Design Brief page	1	group	provided printable	one A4 sheet per group ruled into sections for problem, user, criteria and sketch
problem cards (seed-tray cover, ball barrier, book stand, draught-stopper)	1	group	provided printable	four A5 handwritten cards using the same card texts from the teacher notes
clipboard	1	group	classroom	a hardback book or a sheet of stiff card as a writing board
30 cm ruler	1	group	classroom	a marked strip of card in centimetres
scrap paper for rough notes	2	group	classroom	the back of used worksheets



Safety watch-point

If a pair leaves to measure a door or flowerbed edge, they go with you or an SNA only, for two minutes, then return; the rest of the class stays on the cards.



Teaching moves

- **How engineers start:** Live think-aloud on the marker-ledge problem only: name the user, write three testable criteria, sketch a shallow rail with one size in cm. End with a whole-class call-out. Who is the user? Name one criterion, so all three terms are spoken before cards go out. Head off “we’ll use cardboard” by asking Who is it for, and what must it do?
- **Choose the problem and find the need:** Give each group one card set; 1–2 minutes to choose, then 8–9 minutes on scrap paper for user plus three criteria. Circulate with Who uses it every day? and Could we test that with water, a ball, a book or a fan? Steer any fifth invented problem back to the four cards. Optional: one pair may walk with you to measure a door or flowerbed edge for two minutes only.
- **Sketch the solution:** Hand out one Design Brief page per group. Pace board instructions one at a time: transfer problem, user and criteria; stay inside cardboard, tape, string, lolly sticks and fabric scraps; add labelled sketch with materials and one size; check a builder could follow it. Coach with What joins the parts? and Does this still solve the problem on your card? Supply a shared class measurement if groups cannot leave the room.
- **Finalise the plan:** Pair groups on the clock: two minutes silent read, two minutes one strength plus one question, then designers edit one criterion or one label. Push vague lines like “it should look nice” toward observable checks. Ask the class Would you know how to start building from that sketch?
- **Finish the Design Brief:** Refuse fresh sheets: gaps go on the same page. Walk the room checking three criteria and at least one measurement, group names on, then collect into the project folder or clip to the group tray. Site measurements stay in school; unfinished groups get a brief catch-up before the build, not take-home door or flowerbed figures.

What it should show

Every group leaves with one Design Brief naming a real school user, three testable success criteria, and a labelled junk-kit sketch with at least one size in cm that a child could build next session. A brief that only lists materials, or criteria such as “looks nice”, is incomplete: send them back to name the person and an observable check (fit, stay upright, block water, stop a ball, hold two books).

Misconceptions & interventions

- **“We’ll just use cardboard”:** pupils jump to materials before naming who it is for or what it must do. Hold the card and ask Who is bothered every day? What must it do? Write user need first on scrap paper; materials wait until the sketch.
- **Success criteria stay vague:** “it should be good” or “it should look nice.” Ask How would we test that with a ball, a book, water or a fan? Push to observable checks such as stays upright with two books or stops a tennis ball on a gentle roll.
- **The sketch becomes a fantasy build that no junk kit or one lesson could make.** Point at the shared kit list and the card: Does this still solve the problem, and could we build it next time with cardboard, tape, string, lolly sticks and fabric only?

Differentiation

Emerging	Developing	Proficient
• Offer the board sentence frame: Our user is... They need... We will know it works if... • Pair a strong ideas pupil with a confident sketcher; scribe labels while they direct the drawing.	• Allow draw-first or list-parts-first order, then add one estimated size with a unit label. • After peer feedback, require one tightened criterion that names a clear test.	• Add a real constraint on the brief: max height, must pack away, or no tape on paintwork. • Critique a partner brief: Would a builder know where to start, and which measurement is still missing?

Cross-curricular hook

Link to Maths Measures: groups record at least one size in centimetres (measured or a labelled estimate) on the Design Brief sketch.