

Choose the job, then test a small version first

Lesson at a glance

Open by naming who in school needs something held up without tipping or falling. Demo a pre-built card triangle bracket on a desk edge, loading 1c coins until the tape peels, then pin user need and must-do list from that fail. Groups pick a real school job, build one half-size piece with one shape and one join, and load it until something gives way. They complete one DesignBrief plan page with the failure, two must-dos, and a marked sketch before packing pieces away for the full build.

Learning objectives

- Name a real person or place in school and what must be held up for them
- Build a half-size model and load it until something gives way
- Write two or three must-dos for the full build from what failed on the small test
- Sketch the full build and mark the shape that holds the weight and the join that might break

Before the bell – prep

Pre-build one rough half-size card triangle shelf bracket with tape and a small outer platform; do not build it live. Per group: card strips/scraps, lolly sticks, sticky tape, split pins, string, scissors, rulers. Light weights ready (1c coins, washers or cubes; yoghurt pot on string for hanging loads). No PVA today.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
card strips and card scraps (plain and corrugated)	1	group	classroom	cereal-box card brought from home
lolly sticks	8	group	school kit	strips of folded newspaper rolled tight
sticky tape	1	group	classroom	masking tape
split pins	6	group	school kit	paper fasteners or a single staple applied by an adult
string	1	group	classroom	wool or thin strip of fabric
scissors	1	group	classroom	teacher pre-cuts strips
1c coins or small metal washers	30	group	classroom	identical counting cubes or marbles in a small pot
small pot or cup for hanging loads	1	group	classroom	paper cup with two holes for string
30 cm ruler	1	group	classroom	a marked strip of card as a rough half-size guide
Investigation Journal Design Brief page	1	group	classroom	plain paper with headings: job, user, what failed, must do, sketch

Safety watch-point

Adult help with scissors; no heavy tools. Load low and slowly with light weights only; everyone stands clear of the fall zone.



Teaching moves

- **Test small before you build big:** Place the pre-built bracket on a desk edge. Show only the predict line; load coins one at a time at the outer end while pupils watch. Stop at the fail, name what gave way in plain words, then pin the two board labels: who needs help / what must be held up, and must-do list from what broke. Say once: how it failed tells us what to fix; the real user need sets the real load — eight coins is not four books.
- **Choose the job and the user:** Board the shortlist (library shelf, tablet stand, wet-coat hook rail, desk model of a yard bridge). Kit stays away. Two minutes quiet think, then each group says who, what load, and why it matters. Fold the class in: does that sound like a real need? Bridge jobs stay a short desk prototype, not an outdoor span.
- **Build a half-size test piece:** Kit on desks before go: one trusted shape and one main join only (tape, split pin or string — no glue). Rough half-size that fits on the desk is enough; stop full-size or outdoor-span builds. You or an SNA make tricky cuts. Circulate for five-joins muddle, no load point, or glue reach — redirect to tape, pin or string and a small card platform or hook.
- **Load it until it fails:** Clear desk space; load low and slowly with light weights; everyone clear of the fall zone. Ask watchers what will give way first — shape or join. Listen for peel, bend or tip. If nothing fails, add load or a gentle sideways push. Keep every bent piece for the plan page.
- **Turn failure into a plan:** One DesignBrief plan page per group — protect the full ten minutes; it is today's exit ticket, not homework. Every group leaves with: what failed (shape, join or tip), two measurable must-dos from that fail, and a quick sketch with load-carrying shape and strained join marked. Revoice vague 'stronger' into a checkable criterion as you circulate.
- **Share and look ahead:** Pack first: bag each half-size piece with names, collect DesignBriefs, count pins and coins back. Sample at most two groups in one sentence each — user, what failed, one must-do. One-line look ahead: full-size next with drying time for glue.

What it should show

Expect join failures (tape peel), shape/span bends, or tipping before break — each is useful data. Successful groups name the weak spot plainly and write two checkable must-dos tied to a real school load (e.g. hold four books; back join must not peel), not coin counts scaled up. A piece that never fails still needs the note that a heavier real load is needed next time.

Misconceptions & interventions

- **Breaking the small piece means the idea is bad and we must start again with a new design.** — Hold up the bent piece: the failure names the one thing the full build must fix. Frame it as useful data engineers seek on purpose.
- **If the small shelf held eight coins, the full one will hold eight books — coin count scales straight to the real load.** — Revoice the demo line: failure mode guides the design fix; the real user need (four books, wet coats) sets the real load target.
- **Must-dos stay vague wishes like 'make it stronger' or 'don't break'.** — Point at the DesignBrief and demand a number or yes/no check: hold four reading books; not tip when loaded at the front.

**Differentiation**

Emerging	Developing	Proficient
• Offer a job from the board shortlist and a starter triangle or tube so the group can join and load without freezing on shape choice. • Sentence starters on the plan page: It failed when... so the full one must...	• Refine the brief with a measurable load and a no-tip condition before building. • After the fail, name shape vs join vs tip in plain words before writing the two must-dos.	• On the sketch, mark where the real load will sit and note one material swap that might stop the same failure (e.g. tape replaced by a gusset or split-pin brace). • Plan PVA only for the later full-size build, not today's half-size piece.

Cross-curricular hook

Tie must-dos to Maths measures — name a countable load (four books, one tablet) the full build must hold without tipping.

