

Design and build the solution

Lesson at a glance

Open by propping the class tablet or a hardback book against a pile so it tips, then agree a short user need for a desk stand. Drive the fair-test-planner interactive to set a base-shape option test, then groups assemble pre-cut wide and narrow cradles, nudge-count to tip, and pick a winner. They sketch a full design from the flexible kit and build a first cardboard-and-tape prototype that stands on its own. Close with a quick display-only check against the success criteria.

Learning objectives

- Agree a clear user need for a real classroom problem (a stand for a tipping tablet or book)
- Use a quick fair test to choose between design options
- Design and build a first working prototype of the chosen solution

Before the bell – prep

Night before, cut matched-height base templates per group: both ~5 cm upright; wide ~15×10 cm, narrow ~6×10 cm. Set out cardboard, lolly sticks, masking tape, string, clean recycled boxes/tubs, scissors. One shared load (tablet or hardback book). Prefer tape — no PVA.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
class tablet or hardback book of similar size (stand-in load)	1	group	classroom	a plastic lunchbox filled with exercise books to match the weight
pre-cut same-height wide and narrow base templates (about 5 cm upright face; wide footprint ~15 cm × 10 cm, narrow ~6 cm × 10 cm)	1	group	classroom	cereal-box card cut to the same footprints and 5 cm upright height
flexible build kit (cardboard sheets, clean recycled boxes or tubs, lolly sticks, string, masking tape; optional glue sticks for paper only; optional pre-cut upright strips and small shelf pieces)	1	group	classroom	cereal boxes, newspaper rolls and sticky tape from home collections
scissors	1	group	classroom	one shared class pair with adult cutting support
Investigation Journal pages	1	pupil	provided printable	plain paper with the journal headings listed in Before the Lesson copied from the board

Safety watch-point

Supervised round-tip scissors only; adults make tough card cuts. Keep loads modest so nothing falls toward faces. No running with materials; wipe glue spills; count tools back.



Teaching moves

- **Getting Started:** Hold up the tablet or stand-in book, prop it so the class sees it tip, and ask who a stand is for and what it must never do. Keep the build kit in the press so attention stays on the problem, not the materials.
- **Name the user need:** Pairs talk, then capture agreed phrases on the IWB. Steer toward: holds a tablet or book upright on a desk, stays steady when lightly bumped, easy in and out. Name this as engineering work, not a warm-up.
- **Plan the option test:** Drive the fair-test-planner: Change = base shape; Measure = nudge count to tip (stop at 10); Keep the same = load, nudge force, height. Say the worked model aloud, then groups fill the option-test section of the Investigation Journal. Allow a different pair only if one change, one measure, and matched height still hold — write that pair on the IWB.
- **Run the option test:** Hand each group their two pre-cut templates plus tape and the shared load. Circulate cold-calling fair-test checks: same nudge, same height, same load. Groups repeat once, then choose the base that better meets the user need.
- **Plan the full design:** Display success criteria and the kit list before anyone draws. Plan only: one labelled side sketch (base, support, resting place), materials ticked, criteria ticked. Check the winning base idea is in the sketch before builds start.
- **Build the model:** One kit per group; masking tape for every structural join. Adults cut thick card. Aim for a standing base-plus-support that matches the option-test winner; a brief upright hold is a bonus. Stop the build firmly on time so models can be labelled and stored upright.
- **Reflect and set up next time:** Quick round: one group names a success already met; another names one risk for the later test. Pack models upright and labelled; count scissors back. Optional paper homework: notice one home stand and what stops it tipping.

What it should show

Wide bases usually need more gentle fingertip nudges before tipping than narrow ones at the same height and load. Mixed results almost always mean height or load drifted — re-check the 5 cm upright and the shared book. By the end, a successful prototype stands alone with the winning base idea, at least one support, and named base/support/resting place; full bump and load-in tests come later.

Misconceptions & interventions

- **The coolest-looking stand is the best one.** — Point back to the agreed user need on the IWB: beauty is fine, but success is upright hold, steady when bumped, and easy in/out. Ask which criterion the ‘cool’ feature actually serves.
- **We can change height as well as base shape if it looks steadier.** — Freeze the build and re-voice the planner: only base shape changes; height, load and nudge stay the same. Hand them back the matched-height templates so the comparison stays fair.
- **A prototype has to meet every success criterion today or it has failed.** — Show a standing base-plus-support and affirm it: today’s job is a first working model that stands and uses the winning base; honest wobbles are useful evidence for the later test, not a fail.

**Differentiation**

Emerging	Developing	Proficient
• Offer tips/does not tip as the measure instead of nudge count to 10, and sit with the teacher table to assemble the pre-cut cradles. • Provide a partly folded cradle so the group only tapes, loads and nudges.	• Add a simple front lip or stop on the sketch so the device cannot slide forward, still within the same kit and criteria. • Run a second nudge trial and note whether the winner still holds.	• Critique another group's option test: name one thing that stayed the same and one that would make it unfair. • If finished early, strengthen one weak join or sketch one improvement for the later test — no new kit, no device task.

Cross-curricular hook

Link to Maths Measures — matched 5 cm height and nudge counts turn the base choice into recorded evidence, not a vote.

