

Test, improve and share

Lesson at a glance

Prototypes and Design Briefs sit ready on tables. Groups name their three success criteria aloud, then run a fair first test with books or bean tins, a ruler and a stopwatch, recording pass/not-yet plus one observation per check on the Investigation Journal. They make one evidence-based improvement with limited tape and card, re-test the same way, write one evidence sentence, then present user, change and results at the front or on a desk-round.

Learning objectives

- Test the prototype against the success criteria agreed earlier in this project
- Make one improvement, re-test and record what changed
- Present the design and the evidence of how well it worked

Before the bell – prep

Have each group's prototype and Design Brief on their table before the bell. Set a per-group test kit (3 small books or bean tins, ruler, stopwatch) and clear walkways. Pre-cut card strips and triangles; hold masking tape, straws and scrap for the improve step only. One supervised cutting station.

**Materials**

Item	Qty	Per	Source	Low-cost substitute
group prototypes from earlier in this project	1	group	classroom	if a prototype was damaged, allow a 5-minute rebuild from the original Design Brief sketch before testing
Design Brief pages from earlier in this project	1	group	classroom	a fresh sheet where the group rewrites the three success criteria from memory under teacher check
small test weights (books or bean tins, about 200–400 g)	3	group	classroom	a filled water bottle with the lid on, same bottle for every trial in that group
metre stick or 30 cm ruler	1	group	classroom	a marked string or footprint paces agreed by the group for distance checks
stopwatch	1	group	school kit	classroom clock with a second hand or a phone timer operated by the teacher
masking tape	1	group	classroom	sticky tack or string ties for light joins
drinking straws	6	group	classroom	rolled paper tubes from scrap paper
card offcuts (include pre-cut strips and triangles)	4	group	classroom	cereal-box card brought from home, pre-cut where possible
round-tip scissors	1	group	classroom	teacher makes cuts at a cutting station
sticky notes	4	group	classroom	small scrap-paper slips and pencils; or keep peer feedback spoken only
Investigation Journal pages	1	pupil	provided printable	plain paper ruled into first-test / re-test / conclusion sections by the pupil

Safety watch-point

Stand back in load or collapse tests; mind fingers under structures; clear walkways. Adult supervision at scissors; an adult makes difficult cuts.



Teaching moves

- **Getting Started:** Keep the open short: prototypes out, Design Briefs open at success criteria, no extra build materials yet. Name only the three jobs — test, one improvement, present evidence. Key question: how will we know it worked, not just if it looks good?
- **Success criteria and a fair test:** Project success criteria only. Give groups time to read their own three checks from the Design Brief and say them to a partner. Hold off improvement and evidence vocabulary until groups are choosing a change and comparing results. Stop any urge to rebuild before the first test.
- **First test against the criteria:** Model once with a spare prototype: predict, load one book then two, name pass or fail. Release groups to parallel table tests. Circulate with same weight, same start, same trials. Stop mid-test rebuilds. Ask which criterion they are checking and what a clear pass looks like.
- **Record the first test:** Mirror three write-fors on the board: criterion, pass or not yet, short observation. No conclusion sentence yet. Push specific notes (tipped on the second book) over vague ones. Have two groups share one result only before any change.
- **One improvement:** Release the small improve kit. Before tape or scissors, every group names one change linked to a failed check and writes it on the Investigation Journal. Hold the one-change rule. Prefer pre-cut pieces; only one planned cut per group at the supervised station.
- **Re-test after the change:** Say aloud: same criteria, same method, only one design change. Groups complete the side-by-side comparison and one evidence sentence on the Investigation Journal. Ask whether the aimed-at criterion improved and whether anything unexpected got worse.
- **Present the design and the evidence:** Board the four-part prompt: user and need, what we built, one improvement and why, first-test to re-test evidence. Hear four or five groups for about one minute each, then a desk-round with liked / question stems or sticky notes. Keep feedback on the evidence, not who won.
- **Reflect and pack away:** Two minutes for quick voices on what evidence taught that guessing could not, then a firm three-minute pack-away: prototypes stored or photographed, scissors and weights returned, floor checked for tape and offcuts.

What it should show

Most first prototypes pass some written checks and fail others — useful data, not a failed lesson. After one change (wider base, brace, stronger join), the targeted criterion should improve on the re-test while method stays the same. A surprising drop usually means the re-test was not matched (different load, start or timing) or several changes were made at once.

**Misconceptions & interventions**

- **We should rebuild the whole design if it fails a check.** — Hold them to test-and-record first. Say engineers change one thing so the re-test shows what helped; name the single weakest criterion from their journal before any materials come out.
- **If it looks neat, it worked — we do not need the checks.** — Point them back to the Design Brief criteria and the pass/not-yet column. Ask what a user would trust: a tidy model or a measured result.
- **We can fix the base, the join and the height all at once.** — Ask which single change would help the failed criterion most. If three fixes are listed, keep only one for this re-test so the evidence can be trusted.

Differentiation

Emerging	Developing	Proficient
• Re-run the failed criterion once with the teacher watching, then choose the simplest stabilising change from the kit (wider base, tape join or triangle brace). • Accept clear pass/not-yet with a short observation if the group has no numbers yet.	• Prompt a labelled before-and-after note on the Investigation Journal while they wait after the one change. • Ask whether anything unexpected got worse on the re-test.	• Critique fairness of their own re-test: same load, start and timing as the first test? • In the share, press the evidence sentence — did the claim match the journal results?

Cross-curricular hook

Oral language presentations use the four-part evidence prompt; measures link to Maths when groups time or count loads on the re-test.

