Lesson 36 · engineering

Test, improve and present

Lesson at a glance

Reopen each group's Design Brief and success criteria so the trial is against the job, not looks. Model a live mini-test of a spare stand, then groups test their prototype with shared kit (water stations, soft balls, books, timers) and jot evidence on the Prototype Evaluation page. They make one evidence-based change, re-test the same way, and present problem, evidence, improvement and re-test result to a partner group.

Learning objectives

- Test a prototype against agreed success criteria and record the evidence
- Make one improvement, re-test, and present an analysis of the design process and result

Before the bell — prep

Prototypes and Design Briefs on tables before the bell; no test kit out yet. Centrally set two water stations (jug, tray, teaspoon), two soft balls with marked roll lines, two stopwatches, weights, classroom books and rulers. Keep scrap card, tape and string aside until improve. A roasting tin or lunchbox lid can be a third water tray.

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Materials

Item	Qty	Per	Source	Low-cost substitute
group prototypes built earlier in this project	1	group	classroom	none — the prototypes are essential to this lesson
completed Design Brief pages from earlier in this project	1	group	classroom	a quick rewrite of the success criteria on scrap paper if a brief is missing
Investigation Journal testing page	1	pupil	classroom	plain paper with teacher-led headings spoken aloud
Investigation Journal results page	1	pupil	classroom	reverse of the testing page or plain paper with spoken headings for re-test and conclusion
small weights (washers, coins or 100 g masses)	20	class	school kit	small sealed bags of rice or dried beans
jug of water and shallow tray	2	class	classroom	large bottles of water and roasting tins or lunchbox lids
teaspoon for counted water pours	2	class	classroom	tablespoon used as the same counted scoop every pour
classroom books for stand or holder load tests	6	class	classroom	the same stack of exercise copies or reading-scheme books each time
soft ball	2	class	school kit	pairs of rolled socks
stopwatch or class timer	2	class	school kit	classroom clocks with a second hand, or a phone timer used by the teacher only
metre stick or 30 cm ruler	1	group	classroom	a marked piece of string 30 cm or 1 m long
masking tape	1	group	classroom	clear tape or string ties
scrap card offcuts	5	group	classroom	cereal-box card brought from home
string	1	group	classroom	wool or elastic bands
tissues or paper towels (for dry-check under shelters)	1	group	classroom	scrap paper
cloths for spills	4	class	classroom	old tea towels

Safety watch-point

Stand back if a structure collapses; no throwing weights; wipe water at once; adult makes tricky cuts; keep walkways clear of floor prototypes.

Teaching moves

- **Getting Started:** Have prototypes and Design Briefs ready; do not hand out test kit. Ask two or three groups to read one success criterion aloud. Key question: if we only say it looks good, have we really tested it?
- **What counts as a fair test of our design?:** Name success criteria, evidence and one improvement in under a minute, then immediately model a live test on a spare card stand or barrier: wonder, predict, time 10 seconds free-standing, note any rock, and name one next change. Push the class back to written criteria, not prettiness.
- **First test against the criteria:** Sort groups by problem type and run short turns on scarce kit (two water stations, two balls, two timers). Circulate: which criterion now, what counts as a pass, what stays the same? Waiters watch fairness, not chat. No design changes mid-test; honest fails stay written.
- **Record the evidence:** Five-minute checkpoint only on the Prototype Evaluation page already started in the test. Finish gaps, separate observation from opinion, star the weakest criterion, then move on. If a group wrote only it was good, send them back for one concrete count or observation.
- **Improve once and re-test:** One change only that the evidence supports (widen base, one brace, tape a gap, raise a lip). About nine minutes to improve at tables, nine to re-test with the same method on the same stations. Queue adult cuts early. A second fail is useful evidence, not a disaster.
- **Present the design and the evidence:** Pair groups for one-minute mini-shares using the four-beat board prompt: problem and user, first-test evidence, one improvement, re-test and learning. Invite two or three pairs to the front. Ask the class whether they heard evidence or only opinion.

What it should show

Success is honest evidence against each brief criterion, not a perfect build. Expect met/not met plus a measure or clear observation, one change tied to the starred weak criterion, and a same-method re-test. A re-test that still fails is valid. Odd passes usually mean opinion replaced criteria, or several parts were changed at once so the comparison is unclear.

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Misconceptions & interventions

- **It looks neat, so it passes.** — Point them back to the written success criteria on the Design Brief: which check did you run, and what did you see or count?
- **We'll fix the base, the roof and the braces all at once.** — Stop the rebuild. Ask which single change the first-test evidence supports, then allow only that change before re-testing.
- **I think it's strong is enough evidence.** — Send them back for one concrete result — washers held, teaspoons poured, ball stops out of three, or seconds upright — linked to a named criterion.

Differentiation

Emerging	Developing	Proficient
• Allow met/not met ticks with one short observation note per criterion rather than full measured write-ups. • Sit the group at the teacher table for the first criterion so the test method is modelled once more.	• Where the criterion allows, add a measured result (time, count or distance) and star the weakest part with a clear why.	• After re-test, critique fairness aloud: what stayed the same, and what would an engineer try next? • In the pair share, name one piece of peer evidence heard and one question still held.

Cross-curricular hook

Links to Oral Language: structured one-minute evidence talks, and Maths measures (counts, time, same-height pours).