Lesson 31

engineering

Test, improve and re-test

Lesson at a glance

Open with a hands-up poll on which of the three feeder jobs each group's earlier prototype already does well. Agree the shared fair-test method and 0–2 rubric, practise the ten-second shower countdown on the fair-test-timer interactive, then groups score holds-seed and stable-perch at tables before queuing at two pour stations. Pool first-test totals on the data-recorder bar chart, make one evidence-based change in a hard 7-minute window, re-test the same way, and close with a talk on what the score change shows.

Learning objectives

- Fair-test the feeder against agreed success criteria and record results
- Make one evidence-based improvement to the prototype
- Re-test and compare with the first test results

Before the bell — prep

Have every group's feeder on a tray before the bell. Set two pour stations (watering can/jug + tray each) with one agreed spout height (~30 cm, metre stick). Board-ready 0–2 rubric strip, bird seed, spoons, paper towels, spare tops/sticks/tape/card. Open fair-test-timer (10 s) and data-recorder.

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Materials

Item	Qty	Per	Source	Low-cost substitute
group bird-feeder prototype from earlier in this project	1	group	classroom	a simple bottle-and-stick feeder made quickly as a demo if a group's prototype was lost
watering can or large jug with water (pour station)	2	class	classroom	two large jugs used as watering cans
shallow plastic tray	1	group	classroom	roasting tin or deep-sided lunch tray
metre stick	1	class	classroom	30 cm ruler used twice to mark pour height
bird seed	1	class	supermarket	dry rice or dried lentils for the indoor test only (not for real birds afterwards)
tablespoon	1	group	classroom	same-size bottle cap used as a scoop
paper towels	1	class	classroom	old tea towels designated for spills
spare improvement kit (bottle tops, string, lollipop or garden sticks, tape, card offcuts)	1	class	classroom	clean recycling scraps and masking tape only
scissors	1	group	classroom	one shared scissors station with an adult
Investigation Journal page	1	pupil	provided printable	plain paper ruled into first-test / improve / re-test sections

Safety watch-point

Mop spills at once — no running on wet floors. Adult pours if unsteady; supervise scissors on improvements; wash hands after bird seed; no tasting seed.

Teaching moves

- **How we will test fairly:** Project the short board rubric and keep it up for both tests — do not rewrite it live. Run one two-minute demo cycle on a spare feeder: predict, ten-second pour, score stays-dry 0–2 aloud, name the one change you would try. Hang the three words on the method: success criteria, fair test, iteration.
- **Keep the shower fair:** Run one dry countdown on the fair-test-timer with no water and no feeder so the class hears the start/stop rhythm. Stress that the timer is a control, not a race, and that the same height and ten seconds apply to first test and re-test.
- **First test of the feeders:** Send groups to table checks first (holds-seed, two-finger perch for a slow count of three), then pour-station queues. One adult starts each countdown. Circulating, press 'what did you see?' before 'what does it mean?' and stop anyone changing pour height. Scores must land on the Investigation Journal page before any rebuild.
- **Pool the first-test scores:** Enter each group's total out of 6 on the data-recorder, show the bar chart, then hands-up tally which criterion was weakest. Ask only what the chart answers: tallest/shortest bars and what a short bar tells an engineer to fix first. Leave re-test columns empty for now.
- **One improvement, then re-test:** Enforce one change linked to the lowest score and a hard 7-minute build stop — tape half-on is fine. Re-test with the same spoon, height, ten seconds and rubric. If a group has no usable change, they re-test the original and record an unchanged total as valid evidence.
- **What the evidence shows:** Take three or four groups only. Draw out whether the total rose, held or fell, and reframe unchanged or lower scores as useful data. Keep prototypes bagged with Investigation Journal pages for the presentation later in this project.

What it should show

Most groups score unevenly on the first test (often stays-dry or stable perch lowest) with totals well below 6. After one linked change, the targeted criterion and total often rise by 1–2 points; no change or a drop is still valid if the re-test stayed fair. Odd leaps usually mean a gentler pour or a different seed load — re-run with the class controls.

Misconceptions & interventions

- **Changing three things at once and calling it an improvement.** — Point at the lowest first-test score and ask which single fix targets that job. Hold the other two parts still so the re-test can show whether that one change worked.
- **We failed if we didn't get 6.** — Reframe the goal aloud: a fair test, one reasoned change, and an honest comparison. Praise a clear record of 'same' or 'lower' as real engineering evidence.
- **A longer or harder pour makes the dry test 'tougher' and fairer.** — Return to the agreed ten-second height control: if the shower changes, the score is about the test, not the feeder. Re-queue that group on the shared timer.

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Differentiation

Emerging	Developing	Proficient
• Complete holds-seed and stable-perch at the table first, then join the pour queue with adult countdown support. • If the feeder collapses, score honestly and plan one repair as the single improvement rather than a full rebuild.	• Add a short Investigation Journal note on why a criterion scored 1 rather than 2, still using the board rubric.	• Critique whether the class totals would still be comparable if one group had used a longer shower, and say what control protects the pool. • If the re-test total did not rise, name the next single change they would try and which observation drives it.

Cross-curricular hook

Maths Data strand — compare first-test totals out of 6 on the bar chart and spot the class middle value.