

technology

Algorithms and debugging: unplugged to sequenced

Lesson at a glance

Open with everyday ordered sequences pupils know — traffic lights, a school-dinner queue, a PE warm-up — and ask what fails if one step vanishes. Model a live classroom-plant watering algorithm, strip out jumper-detail clutter, then hide a step so water hits the floor and name that bug and the fix. Groups write 5–8 steps on cards for a library, PE-line, plant or art-pack task, break one step, swap packs and debug. They record steps, bug, fix and one left-out detail in the Investigation Journal, then stack forward/turn commands on the algorithm-sequencer interactive to reach the apple in seven steps or fewer.

Learning objectives

- Write precise step-by-step instructions for a real task and identify unnecessary detail
- Find and fix a deliberate bug in another group's algorithm
- Build and debug a sequenced robot route within a step limit

Before the bell – prep

Print one set of the four task cards and cut 8–10 blank step strips per group. Gather three library books, plant plus watering can and tray, four sealed paint pots and art tray. Pair groups for the swap before the bell. Open the algorithm-sequencer interactive in challenge mode on the IWB (or draw a 4×4 grid and use a counter).

Materials

Item	Qty	Per	Source	Low-cost substitute
task prompt cards (library sort, PE line, plant care, pack away art)	1	group	provided printable	write the four task titles on sticky notes
blank step cards or paper strips	10	group	classroom	half-sheets of scrap paper
pencils	1	pupil	classroom	any writing tool
Investigation Journal page	1	pupil	provided printable	a blank page with four short note areas ruled by the pupil
classroom plant, watering can and tray	1	class	classroom	empty cup and a simple plant sketch on the board; mime the pour over a tray
story books for library-sort groups	3	group doing library sort	classroom	three scrap-paper cards labelled with different author surnames
empty or sealed paint pots and art tray for pack-away-art groups	4	group doing pack away art	classroom	four pencil pots or clean yoghurt pots and a shallow box

Safety watch-point

Supervise plant watering over the tray only; seal paint pots before any carry; PE-line groups walk, not run, in the clear floor space near the door.

Teaching moves

- **Precise steps, bugs and fixing them:** Model the full cycle live with the plant, can and tray before any group work. Board only algorithm and bug at first; name debugging the moment you restore the missing walk-to-plant step and re-test. Cross out jumper/smiley clutter aloud as keep-only-what-matters — do not board the word abstraction. Stress that a careful follower still fails if the steps are wrong.
- **What details matter?:** Show one shared prompt under the visualiser only — groups do not hold cards yet. Take three or four keep-or-leave-out calls in about two minutes. Revoice: keep what changes the result, leave out what does not. Ask whether two different clear algorithms could both still work.
- **Write, break and fix:** Run the timed beat tightly: 1 min class vote on missing step / wrong order / wrong direction, 5 min write, 3 min robot-follower test, 2 min deliberate one-step break, 5 min swap-and-debug, 2 min share. The follower may only do what the cards say. When a group acts at the front, ask the class where the bug is and what they would change.
- **Record the algorithm and the fix:** Show the board mini-example first so writing stays to four short notes: steps as commands, the bug in one line, the fix, and one left-out detail with why. Circulate with those four prompts only. Early finishers sketch a shorter algorithm for the same task — no new topic.
- **Robot route challenge:** Drive the algorithm-sequencer on the IWB yourself; pupils have no devices. Set whole-class thumbs-up/down before each Run, then one volunteer adds the next command. Use Get the apple on the 4×4 grid, seven steps or fewer. After a fail, ask which single command to change, then Run again so the debug is visible. Skip the shorter-path extension if time is tight.

What it should show

Groups produce a 5–8 step algorithm that a silent follower can complete, invent one clear break (wrong order, missing move, or vague direction), and the paired group spots and fixes it on re-test. On the sequencer, a workable apple path is three forward, turn left, three forward (7 steps). Odd fails usually mean the robot started facing the wrong way or a turn was stacked without a forward after it — re-check facing and re-run.

Misconceptions & interventions

- **Pupils think a bug means the person following the steps was careless or not trying hard enough.** — Point back to the plant demo: the volunteer followed every visible step and still poured on the floor. Say the steps themselves were wrong — we debug the algorithm, not blame the follower.
- **Pupils treat every extra detail as a bug, or pack the algorithm with jumper-colour and smile-at-friend clutter.** — Hold up one clutter step and ask: if we leave this out, does the job still work? Keep only what changes the result; label harmless extras as clutter, not bugs.
- **On the robot route, pupils stack many turns hoping the path will fix itself, or restart the whole sequence after one wrong move.** — Freeze after the failed Run and ask which single command is wrong. Change only that block, predict thumbs again, and re-run so they see debugging as a small fix plus a test.

Differentiation

Emerging	Developing	Proficient
• Offer the board stem First... Next... Then... Last... and stay at the teacher table while they write 4–5 steps for the simpler PE-line or plant card. • Let them act as the silent follower first so they feel vague steps before writing their own.	• After a successful debug, ask why that one change fixed the job and whether a different fix could also work. • On the sequencer, have them predict thumbs-up/down and name the buggy command before the volunteer edits it.	• Stretch: write a second, shorter algorithm for the same task that keeps only what matters. • On the robot challenge, critique a failed class sequence: which single swap would save a step inside the limit?

Cross-curricular hook

Link to English procedural writing — numbered commands, not story sentences — and to Maths position and direction on the grid.