

Inside one simple system: a closer look

Lesson at a glance

Hold up a closed handheld torch and gather quick guesses about what hides inside. Groups then examine an adult-prepared opened torch (or the picture of its insides on the board), matching component cards (switch, battery, contacts, bulb/LED, casing) to the real parts. A short class talk settles battery and casing under input-process-output, then the flow-builder interactive (IPO layout) runs a removal test. Pupils draw and label their torch system map on the Investigation Journal page.

Learning objectives

- Identify the main components of one simple electrical system and the job each does
- Connect components to the system's inputs, processes and outputs

Before the bell: prep

Before the bell: open one simple torch per group yourself (a group without one uses the picture of a torch's insides on the board). Print one set of component cards per group. Cluster desks in threes or fours. Load the flow-builder interactive on the IWB. No mains devices; no pupil screwdrivers.

Materials

Item	Qty	Per	Source	Low-cost substitute
adult-prepared opened simple battery torch (internals visible: switch, battery bay, contacts, bulb)	1	group	classroom	the picture of a torch's insides on the board, for a group without a torch
component cards (switch, battery, contacts or wires, bulb or LED, casing)	1	group	provided printable	write the five component names on sticky notes
Investigation Journal page	1	pupil	provided printable	plain paper with a quick drawn frame for a labelled diagram
a real torch to draw round (support)	1	pupil needing support	classroom	a pupil draws a simple torch shape freehand
spare AA or AAA batteries for torches	1	class	classroom	use the picture of a torch's insides on the board if batteries are unavailable

Safety watch-point

Adult-prepared opened torches only. Unplugged devices; no mains equipment; no pupil screwdrivers on casings you did not pre-open yourself.

Teaching moves

- **Getting Started:** Hold up a closed torch, switched off. Pin three or four pupil guesses about inside parts on the board without sorting right from wrong. Tell them they will connect real parts to the input-process-output idea they already know.
- **Parts that do a job:** Keep this time at the board under a minute. Introduce only the word component. Send groups off with the short I-wonder / I-predict / I-test script: switch as press, power and path as middle, bulb as light, then look to match.
- **Explore inside a safe system:** Every group must see insides: opened torch or the picture on the board, never a sealed torch alone. Circulate: What can you press? Where is power stored? What gives light? Early finishers sketch an arrow path from switch to bulb on scrap paper.
- **Observe how the parts connect:** Second look is talk-and-point only: no diagrams yet. Have groups point at the path. Prompt: if the battery is removed, what fails first? If the switch stays open, does the bulb light? Celebrate if they notice metal casing forming part of the path.
- **Settle the tricky placements:** Whole-class settle only battery and casing. Switch is the user-action input; battery is power store for the process, not the input. Agree one casing placement (under process or supporting part beside the map) and leave that decision visible for journal drawing.
- **Map the system on the board:** Open flow-builder IPO layout. Place the four cards briskly: do not re-argue placements. Spend the step on the removal test: lift switch, contacts, then bulb one at a time and name what kind of failure each causes. Point at the real torch as each card comes off.
- **Record your system map:** Pupils draw the opened torch on the Investigation Journal page. Minimum: outline, three labelled components, IPO marked. Leave the class IPO map and casing decision up. Anyone who wants a frame draws round a real torch first. Soft-stop at minute 6 so the summary is not cut.

What it should show

Expect switch as input, battery plus contacts/wires as process (power and path), bulb/LED as output. Casing as support or under process if justified. Groups who put the battery under input have mixed the power store with the control action. Revoice using the opened torch. A metal-cased torch may use the casing as part of the path; that is a real finding, not an error.

Misconceptions & interventions

- **The battery is the input because it 'goes into' the torch.** Point at the switch on the opened torch: the input is the action that starts or controls the system. The battery is the power store that, with the contacts, makes the process possible.
- **The casing does no job because it does not light up or move.** Ask what would happen if the parts were loose on the table. Affirm casing as structure that holds the path in place: either under process or as a supporting part beside the IPO map.
- **One wire or contact is enough; they do not need a complete path back.** Trace the path with a finger on the opened torch: battery to contacts to bulb and back. Ask what fails if any gap stays open.

Differentiation

Emerging	Developing	Proficient
• Let the pupil draw round a real torch for a frame, and lay two component cards (switch, bulb) already placed so the pupil labels those and adds one more. • Stay at the teacher table and use sentence starters aloud: The switch is the input because... The bulb is the output because...	• After three labelled parts and IPO marks, add a short job note in their own words for one component. • Ask them to show with a dashed arrow how electricity travels when the switch is on.	• Add casing following the class decision, plus a fuller note on what fails if contacts are removed. • Run a quiet removal critique: which missing part stops the start, which breaks the path, which removes the useful result?

Cross-curricular hook

Link to English oral language: pupils justify placements with evidence phrases: I agree because on the torch I saw...