

Shapes that stop paper bending

Lesson at a glance

Open by holding a flat paper strip out like a diving board so the free end flops, and ask why the paper itself has not changed. Name stiffness and the three shapes — deep V, tight tube, fan folds — then pairs predict which will resist best. Each pair shares the making of one V, one tube and one fan-fold strip, holds each out fairly from one end, and records flop-or-hold on the Investigation Journal page. Close by hunting real tubes and ridges around the room and matching board predictions to what hands felt.

Learning objectives

- Show that the same paper can be floppy or stiff depending on its shape
- Compare a V-fold, a tube and a concertina by how well each resists bending
- Find real examples of tubes and corrugations doing structural work

Before the bell – prep

Cut A4 into strips about 4 cm × 21 cm the day before — four to six strips per pair plus spares. Pre-fold one deep V, one tube and one fan-fold strip per table as support models. Have one poster tube, one piece of ridged card, and a little sticky tape ready to pass round.

Materials

Item	Qty	Per	Source	Low-cost substitute
paper strips cut from A4 (about 4 cm × 21 cm)	4	pair	classroom	tear A4 sheets into long strips by hand at the start of the activity
masking tape (small pieces to hold tube joins)	1	group	classroom	a single staple or a tight pinch to hold the tube closed
rolled poster tube	1	class	classroom	empty kitchen-roll or wrapping-paper tube
ridged card sample	1	class	classroom	side of a ridged cardboard box cut into a hand-sized piece

Safety watch-point

Teacher cuts strips ahead of time. Supervise light use of sticky tape on tubes; keep scraps off the floor during tidy-up.

**Teaching moves**

- **Getting Started:** Hold one flat strip out from one end so the whole class sees it flop. Ask why the paper flops when nothing about the paper has changed. Take two or three guesses and leave them standing — do not correct yet, and keep the shaped strips out of sight.
- **Same paper, different shape:** Briefly name stiffness and the three shapes on the IWB — deep V, tube, fan folds (ridges) — in plain language only. Do not rank them. Keep full definitions as your reference, not a script, and hold back any comparison until after predictions.
- **Predict which shape holds best:** Run a short think-pair-share with shaped strips still hidden. Capture two or three pupil predictions on the board in their own words to return to later. Accept any reasoned pick; say nothing about which you expect to win.
- **Stiffen the strip three ways:** Model fold-and-hold only for about three minutes: same length sticking out, nothing underneath, V as an upright roof beam, tube pinched or lightly taped, fan ridges running hand-to-free-end and left standing. Pairs then share the making so both feel every shape. Circulate for fair-test breakers — V on its side, squashed fan, loose tube — and hand a pre-folded model if a pair is stuck so the compare still happens.
- **Record what your hand told you:** Tell pupils what to record, not how to rule the page: flop or held for flat, V, tube and fan folds, plus which resisted best and one reason. If a pupil only drew, ask for one spoken sentence about the best shape.
- **Hunt the same shapes for real:** Pass round the poster tube and ridged card, then clear two board headings — Tube shapes and Ridged shapes. Offer easy starters yourself (chair legs, ridged display card), let groups point and name finds, and jot each under the matching heading. Ask why a builder might choose a tube or ridged roofing.
- **What did shape change?:** Return to two board predictions and match them to what hands felt. Draw out that the paper stayed the same and only shape changed. Treat loose tubes or shallow Vs as fair-test evidence, not mistakes. Spoken reflect only: what surprised you when you held the shapes?

What it should show

The flat strip flops at once. A deep V held upright usually holds better; fan folds resist well when ridges stay standing; a tight tube often feels stiffest. A surprising flop usually means a loose tube, a shallow V, a fan squashed flat, or a V held on its side — re-fold or re-hold and try again.

Misconceptions & interventions

- **Pupils say the paper must be thicker or stronger to stop flopping.** — Hold the flat strip beside a shaped one made from the same sheet and ask what actually changed. Point back to the identical strips so shape is the only difference.
- **Pupils hold the V on its side or squash the fan flat and conclude those shapes do not work.** — Stop and re-model the upright roof-beam hold and ridges left standing. Ask what changed about the fold or the hold, then let them feel the difference.

Differentiation

Emerging	Developing	Proficient
• Hand the pre-folded V, tube and fan-fold support models so the pair still holds, feels and compares every shape. • Accept a drawn record plus one spoken sentence about which shape held best.	• Prompt pairs to say whether the paper or only the shape changed, and which shape they would trust to hold a light card.	• Try a shallower V against a deeper V, both held as upright roof beams, and say which feels stiffer and why. • Critique a neighbour's test: was the hold length the same, and were the fan ridges left standing?

Cross-curricular hook

Link to Irish corrugated steel roofing and hollow scaffolding tubes — shapes chosen to stay stiff and light in wind and rain.