energy-forces

Forces change motion: an open force investigation

Lesson at a glance

Open with one quick release of a pull-back car and collect guesses about what will start, slow, stop or turn it. Groups try two of three kits (marble run, balloon rocket, pull-back car), then choose one and design a short demo that shows a force changing motion. After table runs, two or three groups showcase on a shared front run while watchers name the forces. Pupils record on the InvestigationLog page with We saw / We think stems, then link the same ideas to bikes, Luas or DART and local roads.

Learning objectives

- Show and describe how forces change how things move, stop and turn
- Design a simple demonstration of a force changing motion
- Link forces that change motion to everyday Irish transport (bikes, Luas or DART, local roads)

Before the bell — prep

Stretch balloon-rocket string lines between chairs or table legs before pupils arrive. Stock each table (or short stations) with marbles and card channels plus books, balloons/straws/tape, and one pull-back car. Clear floor or table runs and mark a start line with tape.

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Materials

Item	Qty	Per	Source	Low-cost substitute
pull-back toy cars	1	group	school kit	a wind-up toy car or a small car rolled by hand from a marked start
marbles	4	group	school kit	smooth round beads or small balls of similar size
cardboard tubes or folded card channels	3	group	classroom	books and a length of card or a ruler as a simple ramp run
hardback books for ramp height	4	group	classroom	wooden blocks or stacked copybooks
balloons	3	group	supermarket	one shared balloon station if stock is low
drinking straws	2	group	supermarket	a short length of narrow tubing or a rolled paper tube taped shut along the seam
string or yarn for balloon-rocket lines	1	station	classroom	wool, twine, or fishing line; or skip balloon rockets and use only pull-back cars and marble runs
chairs or stands for balloon-rocket string lines	2	station	classroom	table legs, door handles, or clamp stands already in the room
sticky tape	1	group	classroom	masking tape or reusable putty for light joins
masking tape for a floor start line	1	class	classroom	a chalk line or a metre stick laid as a start marker
Investigation Journal pages	1	pupil	classroom	ruled page headed with: Our question; I predict… because…; What we found out; Start force; Slow, stop or turn force; Did the result match your prediction?

Safety watch-point

Roll marbles and cars away from feet and faces; never aim balloon air at anyone's face; keep string lines at a safe height and collect stray marbles immediately.

Teaching moves

- **Getting Started:** Hold one pull-back car so the class can see it and do a single quick release only. Ask what made it start, slow or turn; jot two or three ideas on the board without correcting them — you will return to them after the demos.
- **What can a force change?:** Define force, motion and change of motion from the car just watched. In about two minutes, pull the car back once and narrate only: spring push starts it, friction slows and stops it, a sideways force can turn it. Revoice any "it ran out of energy" talk into a named contact force.
- **Try the force kit:** Give every group a genuine try of two kits within about ten minutes. Circulate with What started it? What slowed it? Could you make it turn? Stop after two kits even if a third sits unused — choice still works because all three types are in the room.
- **Design your force show:** Keep this to five minutes: groups pick one kit, name the start force and the slow/stop/turn force, and agree one deliberate change (height, pull-back, air). Predictions stay in-group as We think ... because ...; sample two or three groups as you circulate rather than a full line-up.
- **Show a force changing motion:** Part A: table runs to refine once (tracks and strings should already exist). Part B: stop the room and invite two or three different kits onto a clear central run. Fold watchers in with What force started that? What changed the direction? If table runs overrun, cut showcase groups rather than the watcher talk.
- **Record the forces:** Model the board example aloud once, then release pupils to the InvestigationLog page. Coach the split: slowed on the carpet is We saw; friction slowed it is We think. Optional kit/force labels only for fast finishers; if writing is slow, one scribe plus an arrow sketch of the path.
- **What did the forces do?:** Beat A: pool start forces (spring, balloon air, gravity) and slow/stop/turn forces (friction, curve, bump). Beat B: map the same ideas onto Luas/DART braking, bike brakes on the school run, and a familiar local road or hill. Display-only talk — nothing typed.

What it should show

A successful demo shows a clear start force and a clear change (speed, stop or turn) with a named force for that change. Expect spring/air/gravity to start and floor, track or string friction to slow and stop; curves or steered wheels turn. Balloon rockets that go nowhere usually need a tighter string, straighter straw and firmer tape; marbles leaving the track need lower sides or a gentler slope.

Misconceptions & interventions

- **It stopped because it ran out of energy — pupils name no force for the slow-down.** — Ask what was touching or rubbing the object when it slowed. Revoice: friction with the floor, track or carpet was the push that changed the motion.
- **The balloon rocket stopped because the air ran out.** — Agree the air push ended, then prompt: once that forward push stopped, friction with the string and air could slow it to a stop. Have them name both parts.

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Differentiation

Emerging	Developing	Proficient
• Stay with one familiar kit from the try-out and use a partly set ramp or pre-threaded balloon string so the group can focus on naming start and slow forces. • Allow one scribe plus a path sketch with arrows if We saw / We think writing is slow.	• Prompt one deliberate change (start height, pull-back amount, or balloon air) so the motion difference is visible to the class. • Ask which force they would name if the same demo ran on carpet instead of a smooth table.	• Add a second labelled arrow sketch for a different stage of the run, or note one change that would make the demo clearer next time. • Critique a showcase demo: was the change of motion obvious to watchers, and what would make the fair comparison sharper?

Cross-curricular hook

Link Beat B to Geography and everyday Irish transport — Luas, DART, bikes and a familiar local road or hill the class already knows.