

living-things

The skeleton and muscles: how we move

Lesson at a glance

Open by bending an elbow and asking what hidden team under the skin makes that move possible. Pupils feel their own biceps and triceps firm and soften as they bend and straighten, then build a card-strip hinge joint with a split pin and two opposite elastic bands. Groups predict aloud, pull each band in turn, and check the model against the arm. They draw and label the working pair on the Investigation Journal page before sharing one discovery.

Learning objectives

- Build and label a model hinge joint with a muscle pair that pulls to bend and straighten it
- Explain that bones and muscles work as a team, with muscles pulling in pairs

Before the bell – prep

Night before: cut two card strips per group (about 15 cm × 3 cm), check split pins open freely, and gather matching elastic bands plus sticky tape or tack. Print the Investigation Journal page. Pre-punch pin holes for groups who need motor support.

Materials

Item	Qty	Per	Source	Low-cost substitute
card strips (about 15 cm by 3 cm)	2	group	classroom	stiff cereal-box card cut into strips
split pins (paper fasteners)	1	group	classroom	a soft twist of pipe cleaner through punched holes, ends folded flat
elastic bands	2	group	classroom	short loops of stretchy hair band or cut rubber glove strips tied in loops
scissors (round-tip or classroom safe)	1	group	classroom	teacher pre-cuts all card so groups need no scissors
sticky tape or sticky tack	1	group	classroom	a small piece of masking tape
Investigation Journal page	1	pupil	provided printable	plain A4 sheet with space to draw and label



Safety watch-point

Adult supervision with scissors; an adult makes tricky cuts. Open split pins fully on the desk, never toward faces. Count scissors back in.

Teaching moves

- **Bones and muscles work as a team:** Unfold the three ideas one at a time with a gesture between each: hinge joint like a door, muscles supply the force, muscles only pull so a pair is needed. Close by asking which muscle pulls when you bend the elbow and take two or three answers rather than settling it yourself.
- **Feel your own arm:** Whole-class first: hand on front of upper arm, slow bend; hand on back, slow straighten. Ask which muscle firms each way and whether one softens while the other firms. Keep bends gentle — no weights or fast reps. Link aloud: muscles only pull, so a pair is needed for both directions.
- **Build a hinge joint and muscle pair:** Demo one complete model at the front before groups start. Hold it up and name the faces — front of the arm, back of the arm — and insist the two elastics go on opposite faces. Do not pull yet. Watch for pins too tight, both bands on one face, or unanchored ends; fix those snags at the table.
- **Test how the model moves:** Model the inquiry cycle aloud here: I wonder, I predict, I test, I observed. Groups predict out loud before anyone tugs, then pull front only, back only, then alternate. Ask at each table: which elastic is the biceps, which the triceps, and why two not one?
- **Record your model:** Circulate for labels: two bones, hinge joint, front and back muscle, and arrows or notes for which pull bends and which straightens. A failed model still gets drawn as the intended design with one fix noted. Offer starters: The front elastic pulls to... On my arm I felt...
- **Share what we found:** Invite three or four groups to demo one pull each. Fold the class in: Are they right about which elastic bends it? What would happen with only one muscle? If anyone still says a muscle pushes, return to the triceps pull on the model and on a real arm.

What it should show

Front elastic pull bends the joint; back elastic pull straightens it; the opposite band goes slack. A model that locks, twists, or only bends one way usually has both elastics on the same face or a pin too tight — move one band to the opposite face and loosen the pin, then re-test.



Misconceptions & interventions

- **Pupils say muscles push the arm straight.** — Return to the model and the real arm: pull only the back elastic and feel the triceps firm on a straighten. Say it plainly — muscles only pull; straightening is the opposite muscle pulling.
- **Pupils think one muscle can both bend and straighten the joint.** — Ask can a rubber band push? Then have them try the model with only one elastic — it will move one way and stall. The pair is needed because each muscle only pulls.
- **Groups put both elastics on the same face of the card arm.** — Let the failed straighten happen, then ask why the joint will not go back. Hold up a working model and point front versus back so they move one band to the opposite face.

Differentiation

Emerging	Developing	Proficient
• Pre-punch the pin holes and anchor one elastic end before the group starts; partner describes arm feel if repeated bends are not suitable. • Sentence starters on the Journal: The front elastic pulls to... On my arm I felt...	• After a working pair, try the optional third trial: hold both elastics gently taut and notice they cannot both pull hard at once.	• Add a paper hand on the lower strip and label which elastic is biceps and which is triceps after the test; explain to another group why one muscle alone cannot straighten the joint.

Cross-curricular hook

Link to PE — name the same biceps–triceps pair pupils use when doing a controlled arm curl or throwing underarm.