

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 elbow: two strips joined by a split pin, the forearm's 3 cm elbow point sticking out past it, a yellow band taped to the front of the forearm and a red band taped to the elbow point. Groups predict aloud, pull each band's free end in turn, try to push one, 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 give each group two elastic bands of different colours and sticky tape. Make one finished model from the build guide to show. Tie a 50 cm string round a book for the step 2 demonstration. Print the Investigation Journal page. Mark the dots and make the 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, two of different colours (the build guide calls them yellow and red)	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	1	group	classroom	masking tape
a piece of string about 50 cm long, and a book	1	class	classroom	a skipping rope or a scarf, and a pencil case
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 on the desk, never towards faces, and pull bands gently along the card. Count scissors back in.

Teaching moves

- **Bones and muscles work as a team:** Bend an elbow and point to the door hinge. Show a string pulling a book and failing to push it: a muscle is the same, it can only pull, getting shorter and fatter as it does. Then the two-arm picture: the biceps pulls to bend, the triceps pulls on the elbow point to straighten, and the other muscle relaxes each time. Check: can your biceps push your arm straight?
- **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:** Hold up your finished model and name its parts: two bones, the split pin hinge, the 3 cm elbow point, the yellow band on the front and the red band on the elbow point. Do not pull yet. Groups follow the build guide one move at a time, checking each against its picture. Watch for a forearm with no elbow point, a pin too tight, flat tape that slips, and a red band taped below the pin.
- **Test how the model moves:** Model the inquiry cycle aloud here: I wonder, I predict, I test, I observed. Groups predict out loud, hold the upper arm still, and pull each band's top end towards the shoulder: yellow bends the arm, red straightens it. Then they try to push a band: nothing moves. Ask at each table: which band 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

Pulling the yellow band lifts the forearm; pulling the red band swings it back until the arm is straight; pushing a band does nothing. A model that only bends has its red band taped below the pin: move it to the tip of the elbow point. A forearm that will not swing has its pin too tight.



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 tape the red band to the forearm below the pin.** Let them pull it and see the arm bend, not straighten. Then point to the elbow point on the finished model and on their own elbow: the back muscle pulls on the bit behind the hinge.

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, pull both bands at once: the forearm hardly moves, because the two pulls work against each other.	• 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.

