

living-things

The skeleton and muscles: how we move

Lesson at a glance

Open by asking what happens under the skin when you bend an elbow, then name the hinge joint and the idea that muscles only pull. Pupils feel biceps and triceps firming on their own arm, then build a card-strip arm with a split-pin hinge and two opposite elastic bands. Groups predict, pull each elastic in turn, and match the model to the arm. They draw and label the model on the Investigation Journal page, then share one discovery in a talk.

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

Before the lesson: print the Investigation Journal page; cut card strips to roughly equal lengths (about 15 cm × 3 cm); check split pins open easily; gather matching elastic bands per group plus sticky tape or sticky tack. Pre-punch pin holes for groups who need motor support. Demo one finished model yourself first.

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; 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: elbow bend equals hinge joint; something is pulling under the skin; muscles only pull so a pair is needed. Keep one check question on the board. Head off 'muscles push the arm straight' before it sticks.
- **Feel your own arm:** Whole class first: hand on the front of the upper arm and bend slowly to feel the biceps firm, then hand on the back and straighten to feel the triceps firm. Each time, ask which is firm and which is soft. Keep to slow bends only, with no weights or fast reps.
- **Build a hinge joint and muscle pair:** Demo one complete model at the front, thinking aloud. Hold it up and point clearly: this face is front, this face is back — do not pull the elastics yet. Watch for pin too tight, both elastics on the same side, or ends not anchored.
- **Test how the model moves:** Model the inquiry cycle aloud here: I wonder, I predict, I test, I observed. Groups say the prediction before anyone tugs. Pull front only, then back only. Ask which elastic is like the biceps and why two are needed, not one.
- **Record your model:** Pupils draw and label the model on the Investigation Journal page. Check for two bones, hinge, two muscles, and which pulls to bend or straighten. If a model failed, they still draw the intended design and note one fix.
- **Share what we found:** Invite three or four groups to demonstrate 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 a real arm.

What it should show

Front elastic pull bends the joint; back elastic pull straightens it; the opposite band slackens. That matches biceps (bend) and triceps (straighten) on the real arm. A joint that locks or twists usually has both elastics on the same face — move one to the opposite side and re-test. A pin that is too tight stops any bend.



Misconceptions & interventions

- **Pupils say muscles push the arm straight.** — Return to the model and the real arm: show the back elastic (triceps) pulling to straighten while the front goes slack. Revoice: muscles only pull; the opposite muscle does the straighten.
- **Pupils think one muscle alone can both bend and straighten the joint.** — Cover or remove one elastic and ask them to make both moves. They cannot — one pull only works one way, so a pair is needed.
- **Groups put both elastics on the same face of the card arm.** — Hold up a correct demo and point front vs back again. Move one band to the opposite face, re-anchor both ends, and re-run the two pulls.

Differentiation

Emerging	Developing	Proficient
• Pre-punch pin holes and offer a partly-built joint (strips already pinned) so the pupil only anchors the two elastics on opposite faces. • Pupils who should not do repeated arm bends watch a partner or feel the teacher's arm with permission and describe what they see.	• After the two pulls work, try the optional third trial: hold both elastics gently taut and notice they cannot both pull hard at once. • Use sentence starters on the journal page: The front elastic pulls to... The back elastic pulls to... On my arm I felt...	• Once tested, label which elastic is biceps and which is triceps, and add a paper hand shape on the lower strip. • In the share, explain why a hinge joint needs a muscle pair and what would fail with only one muscle.

Cross-curricular hook

Links to PE body awareness — name biceps and triceps when bending and straightening in warm-ups.