

PRIMARY STE · FOR TEACHERS

Teacher Resource Book

4th Class

Materials, safety, facilitation and answers



Course materials & shopping list

Every material declared across the course, grouped by item. Gather these for the term.

Item	Quantities seen	Per	Source	Lessons
30 cm ruler	1	group	school kit	3
blank question cards for the 'I wonder' board	1	pupil	classroom	1
cloth drawstring feely-bag holding 3 to 4 safe everyday objects (conker, smooth pebble, wooden block, sponge)	1	group	classroom	3
coloured pencils	1	group	classroom	1
Investigation Journal data table page	1	pupil	classroom	2
Investigation Journal page	1; 1	group, pupil	classroom	1, 3
poster paper for presenting	1	group	classroom	1
station research cards (famous bridge, wind farm, Irish scientist, clean water, air-filled tyre, submarine)	1	group	classroom	1
stopwatch	1	group	school kit	2

NATURE OF STEM

01

Living things – one organ in depth, classifying & ecosystems

- L1 STEM That Changed Ireland

- L2 One Organ in Action: Investigating the Heart

- L3 The Brain, Senses and Reflexes



STEM That Changed Ireland

Lesson at a glance

Open by asking pupils to name everything they used this morning — tap, light switch, bus — and label it all as STEM. Walk the four-strand table one row at a time, then model the electric-light story aloud as a 'before → what changed' sentence. Groups become experts at one of six Irish STEM stations (bridge, wind farm, Callan, clean water, Dunlop tyre, Holland's submarine), filling the three-box Investigation Journal page, then teach the class. Close by starting the year's 'I wonder' board.

Learning objectives

- Explore how STEM has evolved and is woven through everyday Irish life
- Identify an Irish STEM person, place or invention and explain what it changed
- Present findings clearly to the class and pose a new 'I wonder' question

Before the bell – prep

Print the six station cards (one per group — full text is in the lesson notes) and one three-box Investigation Journal page per group the day before, and set out the six stations around the room. If you have more than six groups, double up two groups on one station and pair them to co-present. Have wall or noticeboard space cleared for the 'I wonder' board cards.

Materials

Item	Qty	Per	Source	Low-cost substitute
station research cards (famous bridge, wind farm, Irish scientist, clean water, air-filled tyre, submarine)	1	group	classroom	display one card at a time on the IWB and rotate groups
Investigation Journal page	1	group	classroom	a sheet of plain paper folded into three boxes
poster paper for presenting	1	group	classroom	the back of scrap paper
coloured pencils	1	group	classroom	ordinary pencils
blank question cards for the 'I wonder' board	1	pupil	classroom	small squares cut from scrap paper

Safety watch-point

No physical hazards in this lesson; it is research, discussion and presenting only.

Teaching moves

- **What STEM Means:** Read the table one row at a time, not all four boxes in a run — it's dense. After each row, get the class to call out one everyday thing of their own that fits it (a tap, a road, the clock). Land the line: STEM isn't a school subject, it's how people invent and build the world.
- **How One Invention Changed Things:** Model the electric-light example out loud in full so groups copy the shape, not just the facts: 'Before the electric light, people used candles and lamps; it changed life by making it safe and bright after dark.' Ask 'What else got easier once homes had electric light?' and draw out reading at night, hospitals, factories.
- **Research Your STEM Station:** Send each group to one station with the three-box Investigation Journal page (What is it? / What came before? / What changed?). Move between groups prompting the before → what changed shape. For pupils who need support, read the card aloud with the group and have them underline the bold sentence. Fast finishers add a second 'I wonder' question to the back.
- **Teach the Class:** Hold each group to two minutes for what it is, what came before, and what changed. After each one, ask the listening class 'What changed because of this?' so everyone stays folded in, not just the presenters. Praise clear before → after sentences. If groups doubled up, paired co-presenters share one slot — one says the 'before', one the 'what changed'.

What it should show

Each group's three boxes should hold a clear before → what changed contrast: e.g. crossing a river went from slow and risky to quick and safe; electricity now from never-ending wind instead of turf that runs out; clean water straight to the tap instead of hours carried from a well. A group that lists only facts with no 'before' has missed the shape — re-voice 'What did people use before this?' at their station.

Misconceptions & interventions

- **Pupils think STEM only means computers and modern gadgets.** — Hold up the stone-bridge station card — a bridge built two hundred years ago is engineering too. Stress that working out the curved arch so the weight holds itself up is STEM, no electricity involved.
- **Pupils name a famous Irish thing but can't say what changed because of it.** — Point at the bold sentence on their station card and ask 'What did people do BEFORE this existed?' Once they have the before, the change appears by contrast — that's exactly the shape the electric-light example modelled.

Differentiation

Emerging	Developing	Proficient
<ul style="list-style-type: none"> • Read the station card aloud with the group and have them underline the one bold sentence, then draw rather than write in the three boxes. 	<ul style="list-style-type: none"> • Ask the group to add one more thing that got easier because of their invention, beyond what the card states. 	<ul style="list-style-type: none"> • Have fast finishers write a second 'I wonder' question on the back of the page, or link their station to another group's (e.g. how Callan's electricity work connects to the wind farm).

Cross-curricular hook

Link to History — pupils are placing Irish inventions and inventors like Dunlop of Belfast and Holland of County Clare on a 'before and after' timeline of everyday life.

Lesson 2 · living-things

One Organ in Action: Investigating the Heart

Lesson at a glance

Open by having pupils find their own pulse at the neck and wonder what dancing or running does to it. After a short read on the heart as a pump, model a full pulse investigation aloud at the IWB, then groups sort the planner cards and choose which activities to compare on their FairTestPlanner page. Groups count resting and active pulse for 15 seconds, three times each, circling the middle value, then pool middle values into a class pattern in a display-only science-talk.

Learning objectives

- Investigate how the heart works harder during activity by measuring pulse
- Design and run a fair test, choosing which activities to compare
- Repeat measurements and use the middle value to make results trustworthy

Before the bell – prep

Have one stopwatch (or the IWB clock) per group and a clear stretch of floor to push desks back into. Decide in advance which delivery model you'll use – whole-class counting windows called from the front if every group fits, or groups taking turns in a marked-off area if space is tight. Wrist counting works for anyone who can't feel the neck pulse. Open the FairTestPlanner interactive before the bell.

Materials

Item	Qty	Per	Source	Low-cost substitute
stopwatch	1	group	school kit	the class clock with a second hand, or the fair-test-timer on the IWB
Investigation Journal data table page	1	pupil	classroom	lined paper ruled into a simple table with columns for rest, each activity, count 1, count 2, count 3 and middle value

Safety watch-point

Any pupil who shouldn't exercise becomes a timekeeper or recorder, never left out. Watch for anyone light-headed during the active bursts and let them sit straight away.

Teaching moves

- **Getting Started:** Let everyone find their own pulse first — two fingers under the jaw, stay still. Reassure the ones who can't feel it and point them to the wrist. Take a few out-loud guesses about dancing, then move on. Don't hand out stopwatches yet.
- **How the Heart Works:** Read the two short paragraphs, pointing at your own chest for the heart's fist-size and middle position. Pre-empt the common 'heart is on the left' idea — it sits in the middle, tilted slightly left. Ask a pupil for their own example before revealing each table row.
- **Model the Pulse Cycle:** Model the whole cycle aloud: I wonder... I predict... I'll keep this the same... I counted... I think... Count your own pulse for 15 seconds against the clock, march for a burst, count again. Say the conclusion sentence word for word so groups copy the thinking, not just the counting.
- **Plan Your Fair Test:** Drive the FairTestPlanner on the IWB and sort the five cards with the class: the activity → Change, how fast the heart beats → Measure, and counting time, who counts and the stopwatch → Keep the same. Be explicit that the group's real choice is which activities to compare and how many — not whether to keep the counting time fair.
- **Measure and Record:** Push desks back. Run resting count first, then one minute of the chosen activity, then count again — three goes each. Walk the room and model finding the pulse for slower counters. Show the middle value simply: line three counts up smallest to biggest, circle the middle; if two tie, that's the middle.
- **Pool and Discuss the Class Results:** Collect a resting figure and a busiest-activity figure from a few groups on the board. Draw out the pattern aloud — the heart beats faster the harder the body works — and ask why muscles need more blood. This is display-only talk; nobody types anything.

What it should show

Expect every group's active middle value to be clearly higher than its resting one, and the harder the activity the bigger the jump. A group whose active count barely rose usually picked a gentle activity (walking on the spot) or stopped moving before counting — check they counted straight after a full minute of effort. A wildly high resting count usually means they miscounted or couldn't find a steady beat.

Misconceptions & interventions

- **Pupils think the heart is on the left side of the chest.** — Point to the middle of your own chest as you read — the heart sits in the centre, tilted only slightly left. Have pupils place a hand mid-chest, not on the left.
- **Pupils take the highest of their three counts because 'that's the real one'.** — At the board, line up an example like 18, 22, 20 and show the middle is 20 — one odd high count can throw the result, which is why we trust the middle, not the biggest.

Differentiation

Emerging	Developing	Proficient
<ul style="list-style-type: none"> • Pair a slower counter with you or a confident partner to find and hold the pulse before they start. • Let them compare just two activities — resting and one active — and use a pre-marked recording row. 	<ul style="list-style-type: none"> • Have them add a third activity so they see the pulse step up across more levels. • Ask 'why?' — what does the body need more of when muscles work hard? 	<ul style="list-style-type: none"> • Challenge them to spot which group kept the fairest test and explain what made it fair. • Ask them to predict whose middle value should be steadiest and why repeating helped.

Cross-curricular hook

Tie to the Maths Data strand — pupils pool middle values and read the pattern across the class results.



The Brain, Senses and Reflexes



Lesson at a glance

Drop a ruler with no warning between a volunteer's fingers to spark the wonder, then teach the eyes-brain-hand message chain. Model one full catch out loud, then groups run the class-wide fair test: three catches with eyes ready versus three while a partner distracts them, reading the centimetre mark and finding the middle value on the Investigation Journal page. Pool two class figures into a bar chart on the IWB. A feely-bag touch test adds a second sense before a display-only make-sense talk.



Learning objectives

- Investigate how the brain takes in information from the senses and reacts to stimuli, sometimes without thinking
- Compare reaction times under different conditions using a fair test
- Record and compare measured results across the class



Before the bell – prep

Gather one 30 cm ruler per group plus one for your demo. Fill a feely-bag per group with 3–4 safe everyday objects (conker, smooth pebble, wooden block, sponge). Have the IWB data-recorder ready with Condition and Catch distance columns. Mark the 0 cm end so groups always hold the ruler the same way up — that one habit keeps the test fair.



Materials

Item	Qty	Per	Source	Low-cost substitute
30 cm ruler	1	group	school kit	a long strip of stiff card marked with centimetres
cloth drawstring feely-bag holding 3 to 4 safe everyday objects (conker, smooth pebble, wooden block, sponge)	1	group	classroom	a sock or pillowcase with everyday classroom objects inside
Investigation Journal page	1	pupil	classroom	lined paper ruled into a simple table



Safety watch-point

Check feely-bag objects are safe to handle blind — no sharp edges or anything small enough to mouth. Drop rulers gently between fingers, never flick or throw them.



Teaching moves

- **How the Brain Reacts:** Reveal the table one row at a time and point at the body as you read: eyes see, message to brain, brain decides, message to hand. Pre-empt the 'slow = bad at it' mix-up — say reaction times vary and get faster with practice and full attention.
- **Model One Full Catch:** Have a volunteer drop for you and think aloud through all four beats: 'I predict... I test... I observed... I think...'. Catch three times, read the three marks aloud (e.g. 16, 12, 14) and show the middle value is 14 — not adding and dividing, just the one between smallest and largest.
- **Run the Fair Test:** Set groups of three or four: one catches, one drops, one reads and records, then swap. Circulate and watch droppers give no warning and release cleanly. Re-voice 'same ruler, same dropper, same start position' to anyone changing the setup between conditions.
- **Pool the Class Results:** Drive the IWB data-recorder yourself. Enter just two rows — Eyes ready and Distracted — using the typical middle value across groups. Tap to the bar chart and ask: which bar is shorter, and what does a short bar tell us about reaction time?
- **Touch Only: What Is It?:** Pupils take turns: feel without looking, describe (hard/soft, smooth/rough, round/pointy), guess, then reveal. Keep it brief — draw out that the brain also reads touch, not just sight.

What it should show

Expect most groups to catch the ruler LOWER (longer distance, slower reaction) when distracted than with eyes ready — distraction usually slows reactions, and that is a real finding. A group whose distracted catches look faster usually had a half-hearted distractor, or the catcher was peeking at the dropper's signal; re-run with the catcher watching only the ruler and the partner talking steadily.

Misconceptions & interventions

- **Pupils think catching higher up means they are 'better' or quicker.** — Trace it on the ruler: a LOWER catch distance means the fingers closed sooner, so it is the faster reaction. Hold the ruler up and show that the shorter the fall, the quicker the body reacted.
- **Pupils think a reflex like pulling back from a hot pan goes all the way to the brain to decide.** — Keep it simple for the class — say the body just acts automatically to protect you, faster than thinking. Contrast with the ruler catch, where the eyes did send the message to the brain first.

Differentiation

Emerging	Developing	Proficient
<ul style="list-style-type: none"> • Pair with you at the teacher table and let them catch with both hands while you drop slowly to build confidence before timing. • Give a recording row with the three catch boxes pre-labelled so they just write the centimetre mark. 	<ul style="list-style-type: none"> • Add a 'why?' prompt: ask them to predict before each condition and say why distraction might slow the catch. • Have them check their three readings and circle the middle value themselves. 	<ul style="list-style-type: none"> • Ask them to critique the fair test — what would happen if a different person dropped each time? Name one thing kept the same and why it matters. • Challenge them to suggest a third fair condition the class could test next, using only the same ruler.

Cross-curricular hook

Tie to the Maths Data strand — pupils enter the two class figures, read the bar chart and compare which bar is shorter.

Primary STE

Primary STE — 4th Class (Stage 3, Year 2)

This Investigation Journal and its companion Teacher Resource Book are part of Coding Ireland's online learning platform — a full year of science, technology and engineering for 4th Class.

Pupils record their own investigations on these pages: what they wonder, what they predict, what they observe and what the evidence shows. The thinking stays on paper and in the talk; the platform carries the activities.

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Aligned to the NCCA Primary Science, Technology & Engineering specification (Stage 3).

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