nature-of-stem

STEM that changed Ireland

Lesson at a glance

Open with the problem only: send a spoken message across the table with two paper cups and string, no lip-reading. Groups share ideas first with no kit out, then build and improve a cup-and-string set-up, changing one thing at a time. Three groups show live while set-ups stay frozen; the class lands the tight-path idea. Pupils record on the Investigation Journal page, hear the Marconi-at-Clifden story, and pin one group I wonder slip to the board.

Learning objectives

- Solve a simple engineering problem with limited kit and explain the idea that worked
- Connect the challenge to a real STEM breakthrough and how it changed everyday life in Ireland
- Pose a genuine I wonder question for the year's living-things and materials work

Before the bell — prep

Punch a small hole in every cup base the day before. Cut about 2 m of string per group and set one tray each with two punched cups and string ready. Keep one extra pair at the front for kit-handling only. Print Investigation Journal pages and cut I wonder slips.

Lesson 1

Materials

Item	Qty	Per	Source	Low-cost substitute
paper cups with a small hole punched in the base	2	group	supermarket	clean yoghurt pots with a hole punched in the base
string, about 2 m length	1	group	classroom	wool or thin twine
tray to hold the cup-and-string kit	1	group	classroom	a large book or a lunchbox lid as a kit holder
demo cup-and-string pair for kit handling at the front	1	class	classroom	use one group tray briefly for the model, then return it
Investigation Journal pages	1	pupil	print from platform	a blank page headed with the problem, what we tried, what we changed, what worked
paper slips for I wonder questions	1	group	classroom	torn strips of scrap paper
pins or reusable putty for the noticeboard	1	class	classroom	masking tape on a wall space

Safety watch-point

String stays on the table run only. No looping around necks or wrists and no swinging cups.

Teaching moves

- **Getting Started:** Hold up one cup and the string only — no trays out and no working demo. Collect two or three guesses and leave them hanging. Close with: today every group gets the same kit and the same problem; your job is to make it work.
- **How could we solve it?:** Keep kit off the tables so talk stays on ideas. After one minute take one idea from three groups. If tightness comes up, nod but do not confirm. Ask how the listener will know the message without watching mouths, and steer toward facing away or covering eyes.
- **Send the message:** At the front, show threading, knotting inside each cup, rim hold, face-away rule and a short clear word — do not run a slack-then-tight comparison. Send groups to trays and stay mid-room. After a few minutes prompt: change only one thing, test again, notice what changed. Coach fair rules without naming the tight path.
- **Show the class:** Pick three groups with different stories while set-ups are still live. Keep each share under two minutes. Fold watchers in: are they right about the string? What if they let it go slack now? Revoice in one sentence: a tight string carries the spoken wobble; a slack one does not.
- **The idea that worked:** Land tight path from what groups just showed, then one plain STEM line — no long definition list on the board. Speak the science in plain words: speaking wobbles the cup base; the tight string carries it; the other base wobbles and the ear hears it. Ask: was the string a hollow tube the voice ran through?
- **Record on your Investigation Journal page:** Hand out one Investigation Journal page per pupil and record together. Circulate once; prompt stuck pupils with: write the problem in one line, then what you changed, then what worked. Accept plain tight-path language; if a page only says it worked, ask them to add why.
- **Marconi at Clifden:** Walk the three on-screen beats in about two minutes: the problem before, what Clifden did in 1907, and the everyday change. Draw one plain contrast: cups needed a tight string; Marconi's messages went through the air with no cable — same kind of problem, different signal. Name breakthrough here, then take two group answers on the discussion prompts.
- **Our I wonder board:** Hand one slip per group. Two minutes to agree an I wonder question, then pin it up. Pack away under the pin-up: wind string onto cups, trays aside. Close on the chorus: the string had to be tight so the spoken wobble could travel, and STEM is solving real problems with careful trying.

What it should show

Most groups need two or three tries. A clear message comes through when the string is pulled straight and firm, cups are held by the rim, the listener faces away, and the speaker uses a short clear word. Slack string, base-hold (damps the wobble), soft speech or lip-watching are the usual fails — coach those rules and re-test rather than naming tightness for them.

Lesson 1

Misconceptions & interventions

- **Pupils say the string is a hollow tube the voice runs through.** — After the live shares, ask that question straight and land the wobble path: speaking wobbles the cup base; the tight string carries the wobble; the other base wobbles and the ear hears it. No tube.
- **Pupils think Marconi's wireless worked like a giant cup-and-string phone.** — Draw the one plain contrast after the Clifden story: our cups needed a tight string; his messages were a different kind of signal through the air with no cable — same problem type, different solution.

Differentiation

Emerging	Developing	Proficient
• Stay at the teacher table for the first threading and knot; give the rim-hold and face-away rules as a short checklist before they try a message. • Accept a simple sketch plus one plain sentence for the working set-up on the Investigation Journal page.	• Prompt a deliberate one-thing change (tighter string, rim hold, or a shorter louder word) and ask them to say what changed before they freeze the set-up.	• Ask them to predict out loud what will happen if the showing group lets the string go slack, then check against what the class sees. • Stretch the I wonder slip toward a testable follow-on (messages, materials, or living things) the year could chase.

Cross-curricular hook

Link to Geography and local history — name Clifden, Connemara and County Galway as the Irish landmark in the wireless story.