



Porthcurno Telegraph Museum

# Communication Workshop KS3

Schools information Booklet



**About the workshop**

The workshop guides students through the story of communication before the electric telegraph (using flag semaphore), to the development of the electric telegraph, and the undersea cables that made telegrams around the world possible. We draw parallels with modern internet and telephone communications through fibre-optic cables.

**Learning Objectives**

- Understand why we communicate and how flag semaphore worked
- Understand why the electric telegraph developed and the science behind it
- Understand how telegrams were used
- Understand how Porthcurno fits into the story of global communication

**Prior Learning**

It is helpful if pupils:

- recall that a complete circuit is required for electrical devices to work
- can connect a circuit
- understand that a magnet can attract or repel magnetic material

**Health & Safety**

- Students must not use the Wimshurst machine under any circumstances.
- The Wimshurst machine must not be used in the presence of users of heart pacemakers, insulin pumps or cochlear implants
- All activities use batteries only, not mains electricity

**Language for Learning**

Through the activities in this unit pupils will be able to understand, use and spell correctly words and phrases relating to:

- circuit components, *eg battery, cell, bulb or lamp, connecting wire, switch,*
- magnetic concepts, *eg magnet, magnetic, attract, repel, compass*
- electrical concepts, *eg conductor, insulator*
- other, *eg, flag semaphore, telegraph, code, Morse, telegram*



Literacy opportunities include linking the word telegraph with television and telephone.

Through the activities pupils could:

- collaborate with others to share information and ideas, and solve problems
- follow the sequence of actions, processes or ideas being described

**Resources**

- Semaphore flags
- Wimshurst Machine
- Demo circuit: battery, wires, bulb, switch and buzzer
- Electro-magnetic effect board plus paper clips
- Coils & compasses
- Morse key
- Needle + wires
- Sounder + wires
- Bulb/Lamp + wires
- Needle telegraph + wires (complete the circuit at the back)
- Telegram blanks
- Different types of insulator
- World map showing cables
- Pieces of undersea cable (thick and thin)
- Container of damp soil, induction coil, wires, battery, compass
- Fibre-optic cables

**Resources in student trays**

- Semaphore keys
- Circuits: battery, wires (x 3), bulb, switch, buzzer
- Coils & compasses
- Morse code sheets
- Paper & pencils
- Insulating materials

**PORHCUENO TELEGRAPH MUSEUM LEARNING**



<b>LEARNING OBJECTIVES</b> PUPILS SHOULD LEARN	<b>TEACHING ACTIVITIES</b>	<b>LEARNING OUTCOMES</b> PUPILS SHOULD	<b>POINTS TO NOTE</b>	<b>RESOURCES</b>
	Review pupils' understanding of communication by asking them to think about <ul style="list-style-type: none"> <li>• what communication is,</li> <li>• why animals communicate and</li> <li>• how we communicated before we had electricity</li> </ul>			
<ul style="list-style-type: none"> <li>• That flag semaphore was used as a means of visual communication over a distance before electricity</li> <li>• That visual communication only works in the light, with clear visibility and over relatively short distances</li> <li>• That 'repeater stations' could be used, but these introduced errors</li> </ul>	<ul style="list-style-type: none"> <li>• Pupils communicate a message from one end of the room to the other using flag semaphore. All pupils to try to decode the message. Discuss how easy this is.</li> <li>• Introduce idea of poor visibility eg. clouds or hills (use pupils)</li> <li>• Introduce idea of dark (blinds down, lights out)</li> <li>• Introduce idea of what happens when a message has to be repeated (errors creep in like Chinese whispers)</li> <li>• Pupils to state what is good and what is bad about flag semaphore</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the advantages and problems of flag semaphore as a means of communication</li> <li>• Generalise these ideas to other means of visual communication</li> </ul>		<ul style="list-style-type: none"> <li>• Semaphore flags</li> <li>• Semaphore keys (in trays)</li> </ul>

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<ul style="list-style-type: none"> <li>That electricity can be static or flow through a circuit (<b>key idea 1</b>)</li> </ul>	<ul style="list-style-type: none"> <li>Explain that therefore there was a need for a method of communicating over a long distance that could be used at all times and in all weathers and that was quick. Electricity was being discovered at this time and there were 3 key ideas that helped solve the problem of communication.</li> <li>Demonstrate Wimshurst machine (idea discovered by Dutch scientist Van Muschenbroek, 1746). How do pupils know it is making 'static' electricity? What can they see or hear?</li> <li>How do we make electricity flow? Idea of circuit. Abbe Nollet (1746) discovered the idea of a electricity flowing through a circuit (monks)</li> <li>Students to build a simple circuit using battery and lamp. How did they know that the</li> </ul>	<ul style="list-style-type: none"> <li>be able to build a circuit using a battery, connecting wires and bulb.</li> <li>May be able to develop some 'fix-it' ideas, check bulb, battery, connections etc</li> </ul>	<ul style="list-style-type: none"> <li>Students must not use the Wimshurst machine under any circumstances.</li> <li>The Wimshurst machine must not be used in the presence of users of heart pacemakers, insulin pumps or cochlear implants</li> </ul>	<ul style="list-style-type: none"> <li>Wimshurst Machine</li> <li>Demo circuit</li> <li>Batteries, wires, lamps (in trays)</li> </ul>

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<ul style="list-style-type: none"> <li>That an electrical circuit can be switched on and off using a switch <b>(key idea 2)</b></li> </ul>	<p>circuit was working/complete?</p> <ul style="list-style-type: none"> <li>Pupils to build a circuit using a switch</li> <li>How can they tell whether the circuit is complete? Someone may suggest using a bulb. Explain that bulbs were not invented until 1880.</li> </ul>	<ul style="list-style-type: none"> <li>be able to connect a circuit using a battery, connecting wires and switch</li> </ul>		<ul style="list-style-type: none"> <li>Demo circuit</li> <li>Switches (in trays)</li> </ul>
<ul style="list-style-type: none"> <li>That electricity passing through a wire or coil can make a magnetised needle move <b>(key idea 3)</b></li> </ul>	<ul style="list-style-type: none"> <li>1819, Oersted discovered electro-magnetic effect</li> <li>Check understanding of compass</li> <li>Demo effect using board, paper clips and compass. Talk through circuit <u>or</u> students investigate the effect of a current through a coil on a compass, nature of the magnetic field etc</li> <li>Elicit the idea that a complete circuit, switch and electro-magnetic effect allow a 'code'</li> </ul>	<ul style="list-style-type: none"> <li>understand that a switch in the circuit and moving needle allow a code to be made and therefore 'far-writing' or an electric telegraph</li> </ul>		<ul style="list-style-type: none"> <li>Electro-magnetic effect demo board</li> </ul>
<ul style="list-style-type: none"> <li>That the on-off of a circuit with a switch and lamp/sounder/moving needle allows Morse code to be</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrate Morse code using key and simple circuit.</li> </ul>	<ul style="list-style-type: none"> <li>be able to connect a circuit using a battery, connecting wires, buzzer and switch</li> </ul>		<ul style="list-style-type: none"> <li>Morse key and needle</li> </ul>

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<p>sent</p>	<ul style="list-style-type: none"> <li>• Pupils to build a circuit using a switch and buzzer</li> <li>• How do they know whether the switch is working? Buzzer on or off</li> <li>• Pupils send and de-code simple messages using Morse code and the circuit they have built</li> </ul>	<ul style="list-style-type: none"> <li>• understand that if the buzzer is on this shows that there is a complete circuit</li> <li>• be able to send simple messages using the dots and dashes of Morse code</li> </ul>		<ul style="list-style-type: none"> <li>• Morse key and sounder</li> <li>• Morse key and bulb</li> <li>• Needle telegraph</li> <li>• Morse code sheet</li> <li>• Demo circuit</li> <li>• Batteries, wires, switch &amp; buzzer (in trays)</li> <li>• Paper &amp; pencils (in trays)</li> </ul>
<ul style="list-style-type: none"> <li>• That telegraph offices used telegrams to record messages</li> </ul>	<ul style="list-style-type: none"> <li>• Relate pupils' simple circuits to demo telegraph office. Link to the idea of <u>distance</u> (Paddington to Slough etc). Talk through idea of telegram (for example my sister in Exeter), sent in code, received in code, de-coded, written down and delivered.</li> <li>• If time &amp; students willing, could dress up to 'act' the part of</li> </ul>	<ul style="list-style-type: none"> <li>• Pupils <u>could</u> use demo set-up to send, receive and de-code a simple message</li> </ul>		<ul style="list-style-type: none"> <li>• Telegram blanks</li> </ul>

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	<p>sending a telegram using the telegraph office set-up.</p>			
<ul style="list-style-type: none"> <li>• That undersea cables need insulating</li> <li>• That messages were sent under the sea in cables, not just as wires.</li> </ul>	<ul style="list-style-type: none"> <li>• Demo set-up can be used to send messages on land. How were messages sent across the sea? Check understanding of conductor/insulator. What is the problem of sending messages under the sea?</li> <li>• Students to investigate which types of material are most suited to insulating a flexible wire.</li> <li>• Introduce gutta percha.</li> <li>• Show 'cable' structure as opposed to 'wire'. Why does it have the structure it has?</li> </ul>	<ul style="list-style-type: none"> <li>• be able to describe why an insulator was needed.</li> <li>• be able to distinguish between a simple wire and the need for a cable</li> </ul>		<ul style="list-style-type: none"> <li>• World map</li> <li>• Pieces of cable</li> <li>• Different types of insulator</li> </ul>
<ul style="list-style-type: none"> <li>• That undersea cables use an apparently incomplete circuit</li> </ul>	<ul style="list-style-type: none"> <li>• Demo simple 'wire' connection from PK to somewhere overseas (!). What is wrong with this, given our three key ideas? Elicit idea of incomplete circuit</li> <li>• Demo that electricity can be carried through the earth</li> </ul>	<ul style="list-style-type: none"> <li>• be able to understand the idea of a complete/incomplete circuit</li> <li>• be able to identify and incomplete circuit and explain how undersea cables work by using the earth to complete the circuit</li> </ul>		<ul style="list-style-type: none"> <li>• Container of damp soil, induction coil, wires, battery, compass</li> </ul>

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<ul style="list-style-type: none"> <li>• Cables now used to carry internet and telephone signals</li> <li>• Message sent in light rather than electricity</li> </ul>	<ul style="list-style-type: none"> <li>• Use world map to show undersea cables from the Victorian era to 1970s</li> <li>• Relate this to current map of internet/telephone cables</li> <li>• Demo fibre optic cable, on-off nature of light forming code</li> <li>• 'Messages' (internet and telephone) sent much faster than Morse code.</li> </ul>	<ul style="list-style-type: none"> <li>• be able to link idea of global telegraph network to modern internet network</li> </ul>		<ul style="list-style-type: none"> <li>• World map</li> <li>• Fibre-optic cables</li> </ul>
	<ul style="list-style-type: none"> <li>• Review learning. Pupils to talk in groups and be prepared to say three key things they have learned</li> </ul>			