



# Ravenglass Railway Museum

**Resources and activities for Primary Schools**

Innovate Educate Ltd





## Learning at Ravenglass Railway Museum

The Ravenglass Railway Museum is a great place for a school visit. There are many opportunities for learning from the museum, the railway, the site and the community it serves.

These resources share the stories of the railway, its people and the local area. They support particularly local children to learn more about their heritage.

The museum offers an extensive archive and exhibits that share the history of the line and allows visitors to get up close to the locomotives and coaches.

These sessions reflect three important themes in the Railway's history:

- **Communication** (page 4)
- **Ingenuity** (page 28)
- **Energy and power** (page 57)

They explore the themes in the context of science, technology, engineering and mathematics (STEM) alongside social history and the arts.

For each theme there are:

- Pre-visit activities
- Ideas for self-led sessions at the museum
- Post-visit activities.

In addition to the year-round offer, the railway runs very popular seasonal events such as the Santa Express and teachers can use these notes in conjunction with such a visit.

N.B. This activity pack is a 'living' document and is constantly refined through teacher and student feedback – do let us know what you think!

## **Planning a visit**

The railway and museum offer a great deal of opportunities for schools to enhance the delivery of STEM, literacy, and other areas of the curriculum. For information on the activities at the railway and museum, and to plan a visit, see the Ravenglass Railway Museum ([ravenglassrailwaymuseum.co.uk](http://ravenglassrailwaymuseum.co.uk)) and Ravenglass & Eskdale Railway ([Ravenglass-railway.co.uk](http://Ravenglass-railway.co.uk)) websites. Before contacting the venue to book a visit, a useful starting page on the web site can be found at: ([ravenglassrailwaymuseum.co.uk/visit/visitor-info/](http://ravenglassrailwaymuseum.co.uk/visit/visitor-info/))

## **Risk assessment**

It is important that schools produce a risk assessment relevant to their children and circumstances. Activities in these resources contain some suggestions for consideration when producing your risk assessment.

## **Structure of the resources**

The activities in these resources are meant to be flexible. They are not a prescriptive set of step-by-step instructions or minute-by-minute plans. This is so that they are adaptable to the needs of individual schools and classes.

The majority of session activities are suitable for both KS1 and 2 students and resource packs from the Museum can be tailored to suit each Key Stage

All activities have direct links with the school curriculum.

Within each theme are activities that can be carried out before, during and after a visit to the railway. The activities are arranged in panels with activities that include:

- focused activities at the railway and in the museum
- discussion, research and group work
- stem practical investigations
- reporting and writing
- use of information technology.

It is hoped that schools will use these activities to fully integrate a visit to the railway and museum into medium and long-term curriculum delivery plans.

Links to the Museum's learning resources can be found at ([ravenglassrailwaymuseum.co.uk/visit/learning/](http://ravenglassrailwaymuseum.co.uk/visit/learning/))

## **British Science Association CREST Awards**

The activities in this pack have been developed so that teachers have the ability to use them as evidence towards a British Science Association CREST Star Award.

Children are eligible to enter for a CREST Star (5-7 year olds), Superstar (7-11 years old) or Megastar (8-12 years old). CREST award activities typically last around an hour and enable children to:

- Solve a relevant, science-based problem, set within a context
- Work in pairs or small groups, independently of adults
- Take part in practical, hands-on science activities
- Think and talk about science
- Share ideas using a variety of media.

To gain an award, children record their activities in a logbook and upon completing the required number of investigations receive the award.

Further activities and more details of the programme can be obtained from the British Science Association web site at:

<http://www.crestawards.org/run-crest-awards/crest-star>

To register your children, or for advice and guidance on the awards, contact the Cumbria regional CREST Co-ordinator at STEM Cumbria Ltd:

<http://www.stemcumbria.co.uk>

# Theme 1: Communication

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## Introduction

The museum at the Ravenglass and Eskdale Railway tells the stories of the railway, its local communities and the local area. These resources look at communication and how the stories of the railway are told. There are also science, technology, engineering and mathematics (STEM) activities linked with the theme of communication.

In 2017, the museum was extended. This was an opportunity for staff at the museum to think critically about how to tell the railway's stories and, crucially, which stories to tell. The museum has an exhibition area that schools and community groups can use to create their own displays. These sessions are built around children receiving an invitation from staff at the museum to create an exhibition, display or creative response that can be shown either at school or in the museum.

The children will look at how professionals create a new museum. They will then look at how to write for a museum and explore local stories through research with primary and secondary sources.

The resources are designed to engage children actively with the museum through objects, suitcases with objects belonging to different characters and interpretation boards. These sessions also fit with the Arts Award framework for Discover and Explore, for teachers or group leaders who are Arts Award assessors.

## **Story-telling in museums**

These sessions will get children thinking about the ways in which museums tell stories in an engaging and informative manner. They give children the opportunities to develop their skills in creative as well as factual writing, consider the design of exhibits and create their own exhibition to tell a story.

Session 1: Skills to make a museum display				School
<p>The children will be learning about museums and how to create a display for the community exhibition area of the gallery.</p> <p>The children will find out about the people and the skills needed to create a new museum.</p> <p>This activity is also suitable for Arts Award Discover and Explore.</p>				
Introduction	Activities		Plenary	Follow up
<p><b>Discuss</b></p> <p>Have the children been to a museum before?</p> <p>What are the museums for?</p> <p>Who has visited the Ravensglass Railway Museum (or another museum)?</p> <p>What do they enjoy about visiting museums?</p> <p>Is there anything they don't enjoy?</p> <p>Make a list of both.</p> <p><b>Explain</b> that the manager at the museum has asked the children to create a display for the museum.</p>	<p><b>Explore</b></p> <p>First of all the children are going to learn about the skills needed to create a new display.</p> <p>Ask the children to make three lists: one of the skills needed to make a display, one of the people who have these skills.</p> <p>Now ask them to draw links between the people and the skills.</p> <p>What sort of artistic skills do these people have? Add this third list and draw links to the people.</p> <p>Gather feedback. Make it a competition to see who has the longest list.</p>	<p><b>Share</b></p> <p>The children can look at the designs for the museum.</p> <p>This will help them to locate their list of skills in the context of the museum.</p> <p><b>Create</b></p> <p>(KS2) Create a haiku about one of the artists or crafts people who work in museums.</p> <p>A haiku is made up of three lines, the first with five syllables, the second with seven and the final with five.</p> <p>Share the haikus.</p> <p>(KS1) Respond to what you have learned at the museum – e.g. writing, drawing, clay model</p>	<p><b>Group discussion</b></p> <p>Discuss the skills children will need to create their display.</p> <p>Discuss the stages they will go through to create their display. Planning is very important to both artists and crafts people. The process they follow is:</p> <p>Plan/research</p> <p>Designing</p> <p>Making</p> <p>Testing</p> <p>Reviewing.</p>	<p><b>Plan</b></p> <p>The children will visit the museum to look at the display area, look at the other exhibits and objects and they will look at how the museum tells stories.</p> <p>Ask the children to make plans of what they need to gather from their museum visit to help them create their display.</p> <p>Use the headings.</p>

## Supporting information for teachers

The Ravenglass Railway Museum tells stories in many different ways and there are lots of skills, arts and crafts involved in creating a museum. The background to this session is the refurbishment and extension of the Ravenglass Railway Museum in 2017. Museum staff worked with researchers, subject experts, copywriters, designers (museum designers and graphic designers) and volunteers to help tell the stories of the railway. All of the stories focus on the railway, its people, its community and the route followed by the railway line.

A team of people created the museum. Referring back to the list of artists and art and craft work, ask the children what sorts of people might have worked on the museum.

- *Copywriters*
- *Designers*
- *Graphic designers*
- *Museum designers/Interpretation designers*
- *Subject specialists*
- *Photographers*
- *Museum staff*
- *Architects*
- *Construction workers.*



Session 2: The importance of planning and good design				School
This activity explores the importance of good design in a museum setting. Children will explore museum design plans and then create a logo and colour scheme for the museum. This activity is also suitable for Arts Award Discover and Explore.				
Introduction	Activities		Design activity	Follow up
<p><b>Discuss</b></p> <p>Show images from Previous museum design presentation.</p> <p>What do the children think of the old museum design?</p> <p>Prompt them to think about:</p> <ul style="list-style-type: none"> <li>• Objects and how they are displayed</li> <li>• Labels</li> <li>• Colour schemes</li> <li>• Logos</li> <li>• How stories are told</li> <li>• How much information is on panels</li> <li>• How easy or difficult is it to read the panels.</li> </ul>	<p><b>Explain</b></p> <p>The original museum was small so not big enough to display the locomotives and coaches, the main attraction of the railway.</p> <p>Now visitors can learn about the history of the railway by:</p> <ul style="list-style-type: none"> <li>• Dressing up as people who worked on the railway in the past</li> <li>• Discovering their stories</li> <li>• Finding out about how steam trains work from an actual engine</li> <li>• Exploring communication on the railway.</li> </ul>	<p><b>Share the designs PPT</b></p> <p>Children discuss the actual designs in role as:</p> <ul style="list-style-type: none"> <li>• The museum manager</li> <li>• The station master</li> <li>• An engine driver</li> <li>• A teacher thinking of taking a class to visit the museum</li> <li>• A family local family</li> <li>• A family on holiday in the area.</li> </ul> <p>What are the good and bad points about the designs?</p> <p>Are there any ideas the children might like to add?</p> <p>Make a list.</p> <p>Share their ideas (also suitable for an infant role-play activity)</p>	<p><b>Group discussion</b></p> <p>Now the children are in the role of museum designers, ask the children to design a logo that will attract visitors to the museum.</p> <p><b>Think about</b></p> <p>Will they keep the same name (Ravenglass Railway Museum)?</p> <p>What colour scheme will they use.</p> <p>How will the logo work around the museum and in other marketing such as bags, hats etc.</p> <p>Presentation gives examples of designs from different train companies that the children can use for inspiration.</p>	<p><b>Ideas to make the museum more child-friendly</b></p> <p>The staff at the railway want children to enjoy visiting the museum.</p> <p>They have suggested creating a 'set' for children to step into to have their photographs taken by family and friends.</p> <p>What do the children think of this idea?</p> <p>Can they design a 'set' for their classroom photograph/green screen?</p> <p>What other ideas do they think the museum could use to attract children and families?</p>

Even though it was free to go into the Ravensglass Railway Museum, visitors often missed it as they went straight to the railway. Museum staff and the design team extended and refurbished the museum to make it more attractive to wider range of people.

In this session you will share the plans developed by the museum designers when creating the new museum at Ravensglass.

The original museum was small so it could tell some of the railway's stories but it was not big enough to display the locomotives and coaches; the main attractions from the railway.

This is now possible and there are actual trains and coaches that people can touch and sit on. The museum has more space and more things for visitors to do. They can learn about the history of the railway by:

- Dressing up as people who worked on the railway in the past
- Finding out about how steam trains work from an actual engine
- Exploring how people communicate on the railway
- Discovering the stories of people who worked there in the past and those who work here today
- The story of energy in the area.

Ask the children to look at the designs.

What do they think works well and what else might they like to see?

When giving feedback, the children can act in role as:

- The museum manager
- The station master
- An engine driver
- A teacher thinking of taking a class to visit the museum
- A family local family
- A family on holiday in the area.

The staff at the museum want children to enjoy visiting the museum. There are lots of ideas and activities on site designed to engage children. One idea is a 'set' for children to step in to have their photographs taken by family and friends (see image below).

- What do the children think of this idea?
- Can they design a 'set' for their classroom photograph?

## Photo opportunity



An exhibit in the museum allows visitors to sit on a steam locomotive and take a photo.



Session 3: Writing for museums				Museum
This session looks at writing in a museum setting. This is an opportunity to look at writing for different purposes, writing labels, headings, stories, factual information, instructions and signs. It is offered as a session in the museum but could work with a presentation back in school. This activity is also suitable for Arts Award Discover and Explore.				
Introduction	Activities		Plenary	Follow up
<p><b>Explain</b></p> <p>Museums are about objects but words are used in museums too.</p> <p><b>Explain</b> that in museums people (everyone, of all ages) spend between three seconds and three minutes in front of text, depending on how interesting they find it.</p> <p>The best way to grab someone's attention is through an interesting, label, headline, fact or story.</p>	<p><b>Explore</b></p> <p>Children look around the gallery and list or photograph the different types of text they can see. Ask the children to share their list with the group. Can they group the types of text? The items should fall into:</p> <ul style="list-style-type: none"> <li>• Signs</li> <li>• Labels</li> <li>• Titles</li> <li>• Interpretation panels</li> </ul> <p>With</p> <ul style="list-style-type: none"> <li>• Stories</li> <li>• Facts</li> <li>• Quotations</li> <li>• Instructions.</li> </ul> <p>What is similar and different about the writing?</p>	<p><b>Describe</b></p> <p>In pairs, ask the children to stand with their backs to each other. Give an object to one child and then ask the other child to ask questions to see if they can work out what the object might be. The child holding the object can only say 'yes' or 'no' when asked a question.</p> <p>Can their partner work out what the object is just from their description?</p>	<p><b>Create and share</b></p> <p>The children will choose an object in the museum and write a label for that object.</p> <p>Ask them to look carefully at their object and write down as many adjectives as they can. Do they know anything about their object's story or background? How can they find out more?</p> <p>Labels must be short, no more than ten words.</p> <p>They must give visitors to the museum enough information to understand what the object is.</p>	<p><b>Plan</b></p> <p>How will children let people know about their special display?</p> <p>Ask them to start to design an invitation. Will there be a special opening event? Who will they invite?</p> <p>Can they design a poster to advertise their display online?</p> <p>Can they write a blog about the process of creating their display?</p>

## Supporting information for teachers

When creating this exhibition staff had very clear guidelines for providing the words around the gallery. The PowerPoint presentation *Design brief for the new museum*, can be used by teachers to see the brief that was given to the designers. It can be modified for use with children.

When visiting the museum, have children look around the gallery and see how many different types of text they can see. Ask the children to list or photograph as many different types of writing they can find. Writing should fall into:

- Signs
- Labels
- Titles
- Interpretation panels

With

- Stories
- Facts
- Quotations
- Instructions

Ask the children to share their list with the group.

What are the similarities and differences between the different types of writing, for example: stories and factual information; directions and labels?

The text should be written in plain English which means short active, not passive, sentences. It should capture people's imagination. Every word on the labels or panels should have a purpose.

Have children in groups look at one particular exhibit and panel to consider it in more detail.

In museums people (everyone, of all ages) spend between three seconds and three minutes in front of text, depending on how interesting they find it.

It is important to grab people's attention and the best way to do that is through great stories or unusual facts. Researchers at the museum had to piece together stories from the museum's collection, records in the archive and pictures. Explain that archives hold historic documents and show the children a selection of historic documents from the archive. (The museum has created themed handling collections of leaflets, booklets, tickets and photographs. These are available for schools to use.)

Can the children use this information to tell a story?

## **Activity**

Ask children to choose objects to display.

Explain that the children are going to write labels for the objects. Labels must be short.

Ask them to write down everything they know about their object.

What are the most important pieces of information?

Now ask them to write a label that will describe the object and intrigue other children visiting the museum.

The word limit for the label is ten words.

## **Become the experts**

When they have completed the labels for their object, is there any advice they would give to museum staff on how to write labels for children?

What would their top tips be? There is a suggestion box at the museum where children can leave their ideas and advice.

Summarise what works. Is there any learning the children can take back for their own writing?

<b>Session 4: Researching different types of display and deciding on a theme for their display</b>				<b>Museum</b>
This session is framed around a visit to the museum to look at the site of the new display and to gather inspiration in terms of presentation and themes or objects to use in a display. This activity is also suitable for Arts Award Discover and Explore and links to PSHE				
<b>Introduction</b>	<b>Activities</b>			<b>Follow up</b>
<p><b>Explain</b></p> <p>The purpose of this visit is research. The children will explore the museum to gather inspiration for their display, looking at:</p> <p><b>The display area</b>  <b>How objects are displayed</b>  <b>How stories are told</b>  <b>What is in the museum for children</b>  <b>Explore subjects for their display.</b></p> <p><b>Ask</b> how this is helpful to them when planning their exhibition.</p> <p>What do they need to do to gather information? Make notes, take photos etc.</p>	<p><b>Explore</b></p> <p>Remind the children of the session on skills. Encourage them in small groups (with a teacher or support worker) to explore the museum.</p> <p>Ask them to see how many examples of different arts and crafts they can spot in the museum. How are the art forms used to tell stories?</p> <p>Which art forms work well to tell stories? Which don't work quite so well?</p> <p>How might they choose to tell stories well in their display?</p>	<p><b>Research through objects</b></p> <p>Explain the children are going to use real objects from the museum to research themes for their display. Before you start, work with the children to set rules to avoid any accidents. (See object handling sheet).</p> <p>Ask the children to set their own rules.</p> <p>These should include:</p> <ul style="list-style-type: none"> <li>• Having clean hands</li> <li>• Sitting down and holding objects with two hands over a table (not so far to drop).</li> </ul>	<p><b>Inspiration through object handling</b></p> <p>Use the object handling kits to explore themes in the museums to help the children decide on a theme for their display. There are three kits:</p> <ul style="list-style-type: none"> <li>• Ratty people</li> <li>• Mary Fair</li> <li>• Building the railway.</li> </ul> <p>Use the object handling information to deliver this session.</p> <p>Children will use questions to describe their object, make deductions about it and write a short paragraph interpreting it for others.</p>	<p><b>Plan</b></p> <p>Ask the children to make detailed plans for their exhibition.</p> <p>What will the theme be?</p> <p>Which objects will they use to tell their stories? What sort of objects will they use? Old objects or will the children create items to display?</p> <p>How will they gather information and objects (friends and families)?</p> <p>How will they let people know about their display?</p>

## **Supporting information for teachers**

The purpose of the museum visit is to:

- Look at good practice in displaying objects in a museum setting
- Gather inspiration for their own display.

When arriving at the museum, the school will be welcomed by museum staff and given their invitation formerly to design an exhibition.

Explain that the museum designers have created a space for local people to use for their own temporary exhibitions. Show this space to the children.

Before the children choose a subject for their display, suggest they have a look around the museum.

First of all, remind them of the session on skills used in creating museums. Ask them to see how many examples of different arts and crafts they can spot in the museum. When they have identified an art form, ask them to look at how the art forms are used to tell stories.

Prompt

- Which art forms work well to tell stories?
- What could be better with the displays?
- What might they choose to use to tell stories well in their displays?
- Give them a few minutes to look around and then report back on their favourite ways of finding out about objects or stories in the museum.

## **Research through objects**

Ask the children to look around the museum to see if they can find any objects or stories that interest them.

What do they find interesting about the objects or stories?

- How are they displayed?
- What works well with the displays?
- Is there anything that could be better?
- Is there an object or theme that interests them that might make the subject of a wider display?



## Research kits and handling objects

Children can create an exhibition based on their own ideas which may be separate from the contents of the museum or they may investigate one of the following themes:

- Ratty people
- Mary Fair
- Building the railway.

In this activity children will handle objects that they might put on display.

Handling objects is a great way to learn about the past. To get the most out of this activity, take a little time to think of questions that will help children to investigate their objects.

The questions will help them to:

- Describe their object
- Make deductions about their object's history
- Interpret the object for a wider audience

Ask them to make a list of questions that will help them to **describe** the object. Imagine they have to describe the object to someone who can't see it.

Next ask them to think of questions that will help them to **learn** (make deductions) about their object and what it might have been used for.

Finally ask them to think of the sorts of questions that will help them to **interpret** the object, or tell its stories to other people.

They need to let museum visitors know about the objects but also capture their imagination. Ask the children to explore the objects.

End this session by creating a plan to deliver the display (either at school or in the museum working closely with staff at the museum)

## Back at school

Finally ask them to create a pop up exhibition about their school telling their story of creating an exhibition at the museum.

To create their exhibition each child can create a piece of artwork, work on the display itself, write labels or text.

## Finally

Children can act as a guide and share the exhibition with other children in the school.

The children could also ask parents, carers, grandparents and friends to contribute to the museum and tell different stories from the community.

## **Signals and circuits: communicating on the railway**

These sessions will give children the opportunity to investigate the science and technology behind communicating on the railway. It allows children to investigate the use of:

- Signal paddles (table-tennis bat shaped signals)
- Pulleys and levers
- Electric circuits and lights

The practical sessions can be carried out before or after visiting the railway. During a visit, children are challenged to look at the different ways that signalling is used to make sure that the trains run safely.

### **Signalling with paddles and lamps**

This session gives children the opportunity to think about how information can be passed without using language. At the railway, encourage children to observe how the guard on the platform signals to the driver using hand signals and whistles.

The presentation introduces the idea of signalling and some of the signals used on a railway. Children then design and make their own signal paddles (like table-tennis bats) and devise a code system before using them in a game of 'Simon says' to test their communication skills.

Children can also investigate the use of torches to signal. Are these easier to see than paddles? How well do they perform indoors (school hall) compared to outdoors in bright sunlight?

Covering the light with a coloured, transparent plastic film will allow children to investigate different colours. How do the colours affect how easy it is to see the lamp?

In the museum, children can see examples of lamps used on the railway.

<b>Session 1: Signalling with paddles and lamps</b>				<b>School, railway and museum</b>
This session can be before or after the visit to the railway. During a visit, have children look at the hand signals from the guard to the driver when a train is ready to depart. The classroom activities can be performed outside, over large distances, or in the school hall.				
<b>Introduction</b>	<b>Activities</b>			<b>Follow up</b>
<p><b>Ask</b></p> <p>Have children think about the different signals that are needed to safely operate the railway. This may include:</p> <ul style="list-style-type: none"> <li>• When all of the passengers are on board the carriages.</li> <li>• When a train can proceed along the tracks.</li> <li>• When a train must stop.</li> </ul> <p>Introduce the challenge that children will first investigate some of the paddles and lamps used to signal on the railway.</p>	<p><b>Railway and museum</b></p> <p>When visiting the railway, have children look for the signals and how the platform despatcher signals to the driver.</p> <p>In the museum, look at the railway lamps and see how they work. Have children consider ways that the colour of the light could be changed on the lamps. This could lead into an investigation on which colours are the easiest to see.</p>	<p><b>Classroom activity</b></p> <p><b>Signal paddles</b></p> <p>Have children make their own signalling paddles. These are simple shapes like table-tennis bats, cut out of available cardboard. Or cardboard shapes attached to 50cm rules.</p> <p>In pairs, challenge children to devise a simple code for a game of 'Simon says' (see the attached sheet) and play it in the classroom, school hall or outside.</p> <p>Is it best to have one or two paddles?</p>	<p><b>Classroom activity</b></p> <p><b>Lamps</b></p> <p>Have children use torches to signal. Torches can be waved (like a paddle) and also switched on and off.</p> <p>Is it easier to see the torch compared to their paddle?</p> <p>Are there any advantages over using paddles?</p> <p>Have children cover the torches with different coloured transparent plastic film. Does changing the colour of the light make a difference in how easy it is to see?</p>	<p><b>Working scientifically</b></p> <p>As an extension, paddles can be tested to see what is the most visible design. Does the size, colour or shape make a difference? What can be measured? How can results be presented and compared?</p> <p><b>Resources</b></p> <p>Coloured paper, aluminium foil, sellotape and 50cm rule.</p> <p>Torches and transparent coloured film.</p> <p>Simon Says code worksheet.</p> <p>Signals presentation.</p>

Create a code so that you can play a game of Simon Says using signal paddles.



Command	Signal position
Simon Says	
Left hand in the air	
Right hand in the air	
Left foot up	
Right foot up	

## **Signalling with levers and pulleys**

This design technology activity allows children to design, make and test levers and pulleys. They are challenged to make semaphore signals like the ones used on the railway.

Children use thick card to make a semaphore-style signal, as seen in the presentation.

<b>Session 2: Signalling with levers and pulleys</b>				<b>School and railway</b>
This session can be before or after the visit to the railway. During a visit, have children look for the semaphore-style signals (see the presentation) and how they are used to tell the driver when to stop and go. Children make and test signals from card.				
<b>Introduction</b>	<b>Activities</b>			<b>Follow up</b>
<p>Revisit the signals presentation if necessary.</p> <p>What do children understand about levers? Think about the position of the pivot point and how a push or pull can make the other side of the lever move up and down.</p> <p>Where have children seen levers? For example a see-saw in a playground.</p> <p>With signals on the railway, chains and wires are used to connect levers in the signal box to signal posts.</p> <p>If appropriate, introduce the idea of pulleys as ways of routing a string to a remote signal post.</p>	<p><b>At the railway</b></p> <p>Have children look for the semaphore-style signals. Always stay safely on the platform and designated paths.</p> <p>Can the children see when the signals tell the driver to stop and when to go?</p>	<p><b>Classroom activity</b></p> <p>Children use card, sellotape, paper fasteners and a wooden rod to make a semaphore signal (see attached worksheet).</p> <p><b>Safety</b></p> <p>A risk assessment should be produced for the activity. In this instance, consider the use of scissors and the sharp edges on paper fasteners.</p>	<p><b>Resources</b></p> <p>A thin wooden rod is used to move the sign. A cheap option is wooden kebab skewers. These have a sharp end which must be removed before the lesson.</p> <p>Card, scissors, sellotape, hole-punch and paper fasteners.</p> <p>Signals presentation.</p> <p>String, pulleys and axles from a design technology supplier for the extension activity.</p>	<p>The signal box at Ravenglass Railway contains a number of levers. Each is connected by a cable, routed around pulleys, to its signal post.</p> <p>Children can be challenged to use a long piece of string, and route it around a series of pulleys, to model the signals at the railway.</p> <p>This offers considerable challenge. Pulleys need to be secured on axles on a suitable base. The challenge could be carried out in a design technology club.</p>

Can you make a railway signal?



1 - Cut out and colour a piece of card for the signal.

3 - Use the hole-punch.  
Put a hole in the signal and a hole in the stand.

4 - Carefully use a paper fastener to attach the signal to the stand.

2 - Cut out a piece of card for the stand.

5 - Attach the control rod.  
Where will you need to attach it to be able to move the signal up and down?



## Signalling with circuits and lights

This activity sets a context for children to make and test electrical circuits containing batteries, switches, wires and lights. Red and green coloured lights can be made by covering bulbs with coloured transparent sweet wrapper plastic.

Coloured LEDs are available from design technology suppliers. If these are used, be sure to get ones of the appropriate voltage for your battery packs and also remember that to work, LEDs must be connected with the correct positive and negative polarity.

Use the plan view of the station and railway lines provided below. Copy and increase its size to A3 and have children route their circuits so that switches are in the signal box and the lights are over the signals. Using a small model train on the plan will allow children to practise changing the signals and moving the locomotive.

### Complexity and extension

This activity can be done on a range of levels and complexities.

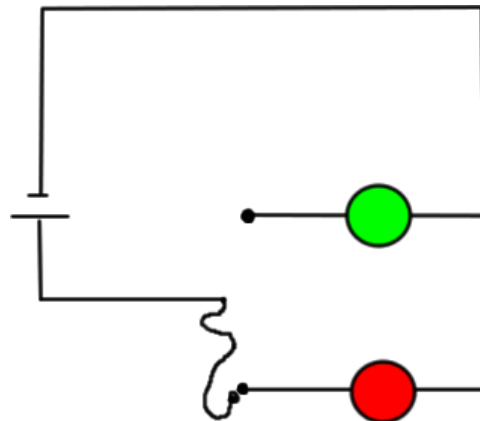
Initial	Signals control a train leaving Platform 1.  Challenge children to make two separate circuits. One with a green light and one with a red light. Each light can be switched on and off independently.  The green light tells the driver it is safe to leave the station. The red light tells the driver to stay at Platform 1.  Use the plan of the station to place the switches in the signal box and the lights at the end of Platform 1.
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This configuration will work but poses a possible problem. The signal operator needs to turn one off and then the other on. If a mistake is made, both lights could be on (or off) at the same time.



**Progression** Have children devise and make a circuit so that if one light is on then the other must be off. This requires children to make a switch that can move between two arms of the circuit (see below). This switch can be made by moving a wire from one connector to the other.

Position the switch in the signal box and the lights at the end of Platform 1.



**Extension** Circuits can be further developed by having signals that allow a train to leave Platform 1 whilst the corresponding signals for Platform 2 are on red.

Signals for movement on and off the turntable can also be produced.

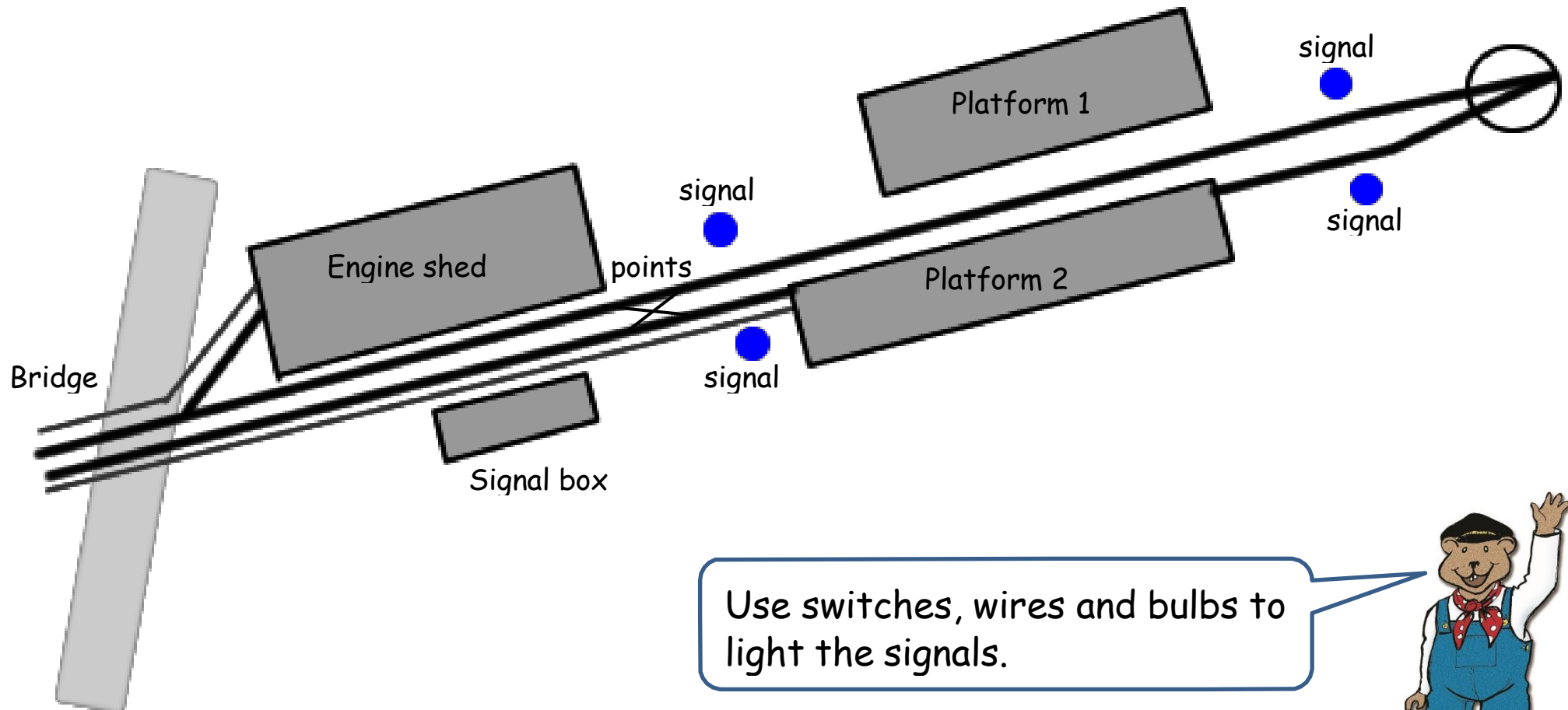
Challenges can also be used to give children an opportunity to practise their written comprehension. For example, by having children make circuits, operate the signals in sequence and move the model locomotive to replicate the movement of a train in the station.

*A train has come in to Platform 1 and dropped off all of its passengers. The locomotive detaches from the front and needs to move onto the turntable to turn around. It then moves past Platform 2 and out of the station. The locomotive then crosses back onto the original track using the crossover points. It then reverses back to attach to the carriages waiting at Platform 1. Once all the passengers are on the train it moves out of the station.*

Some children may recall that the guard signals to the driver when all of the passengers are safely on and off the train.

<b>Session 3: Signalling with circuits and lights (n.b. session primarily appropriate for KS2)</b>				<b>School and railway</b>
This session can be before or after the visit to the railway. Children design and make electric circuits containing switches and lights to signal to a locomotive driver and control its movements. A plan of the station is provided for children to lay-out their circuits from the signal box to signal posts.				
<b>Introduction</b>	<b>Activities</b>			<b>Follow up</b>
<p>Review children's understanding of electric circuits to ensure they remember the use of switches, lights, wires and batteries.</p> <p>Set the context in which they will be making electric circuits to operate light signals to drivers to control the movement of locomotives in and out of the station.</p>	<p><b>At the railway</b></p> <p>Have children observe the movement of the locomotives in and out of the station. How are their movements controlled? How are engines turned around using the turntable?</p> <p><b>Safety</b></p> <p>A risk assessment should be produced for the activity. In this instance, remind children to remain safe whilst at the station and not to move away from designated paths and platforms.</p>	<p><b>Classroom activity</b></p> <p>Children make a series of electric circuits (see details above) to control the movement of a locomotive in and out of the station.</p>	<p><b>Resources</b></p> <p>Copy the plan of the station and increase its size to A3 to provide a template. Children should route their wires so that switches are in the signal box and lights are at the appropriate signal posts.</p> <p>Wires, connectors, batteries, lamps (or LEDs), red and green coloured transparent sweet wrapper, switches.</p>	<p>Challenge children to make a diagrammatic representation of their circuits. Such diagrams can move from realistic pictures to circuit diagrams with symbols for the components.</p> <p>Have children write a set of instructions for the movement of a locomotive in and out of the station. These instructions are called 'standard operating procedures' and ensure the safe operation of the railway.</p>

## Plan of Ravenglass and Eskdale Railway



## Theme 2: Ingenuity - building the Ravensglass and Eskdale Railway

### Contents

	Page	STEM	Lit	Art	Hist
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A day in the life of a steam engine driver	33		x	x	x
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Ratty people saving the railway	42		x		
Strong structures at the railway	47	x			
Bridge building challenge	51	x			
Structures and bridges teacher information	54	x			

### Introduction

Ingenuity is an important theme at the Ravensglass Railway Museum. Alongside the science-based resources, these sessions explore the ingenuity of ‘Ratty People’; the characters who have worked on the railway and in some cases still do.

In this series of activities, children investigate how the railway was built and look in more detail at strong structures. During a visit to the railway, children look for examples of strong structures, taking photos and making drawings to build a profile and then back at school develop their understanding of structures to tackle a bridge-building challenge.

## **Curriculum ideas**

Investigating the Navvies who built the railway has links with the history curriculum (a local study) and also gives opportunities for exploring literacy.

The practical activities allow children to practice design, refine and make skills in design technology and illustrate forces and gravity from the science curriculum.

Wider curriculum connections can be made by researching information about bridges in different parts of the world. Facts about the bridges, such as height and span, can lead into numerical comparisons and representations. Changes in bridge design and capabilities over time can be interpreted in the light of the available materials and technology. How could new materials of the future allow bigger and higher bridges?

Bridges can be used to directly link with the Ravenglass and Eskdale railway and local transport links. Children can research the use of bridges in the local area and this can lead to questions that allow children to develop in-depth and thoughtful responses.

How and why are foot bridges different to those that need to carry cars, lorries or trains? The floods of 2015 caused major disruption as roads and bridges were damaged. What effect would a local bridge being out of use have on the children's daily life? How could children build a case for the bridge being repaired as quickly as possible or for the construction of a new bridge in their area?

## **Ratty People**

Ratty People is a theme that can link into STEAM (science technology engineering arts and maths) to bring human faces to science, design and technology activities. It also leads into social history, with a focus on:

- Navvies
- Local characters
- Modern day people who work on the railway.

There are many other stories of Ratty People in the museum that can be used for inspiration.

## **GLOSSARY**

NAVVIES - Men who built railways. Named after 'Navigators' who dug Britain's canals or 'navigations'

Session 1: The Navvies				Museum or school
<p>This session looks at how people have contributed to the history of the Ravensglass and Eskdale Railway. The navvies built the railway through backbreaking work. Used in conjunction with the STEM practical activities, these notes will help children to explore chronology and look at how working conditions have changed over time. This session will work in the museum and back in class.</p> <p>Children can create a display about the navvies who worked on the railway.</p>				
Introduction	Activities			Follow up
<p><b>Explain</b></p> <p>Explain that today the children will explore the lives of the people who built the railway, using old photographs.</p> <p>The photograph supplied is the only known photograph of the workers who built the railway. It shows a gang of navvies under the bridge at Irton Road station.</p>	<p><b>Compare</b></p> <p>Compare this picture with a modern day engineer. What do the children notice that is similar and different?</p> <p>Ask the children to draw an outline of a person. Ask them to dress half as a navvy and half as a modern day engineer.</p> <p>Who do they think would have been the: strongest, safest, most adventurous, most hard-working?</p> <p>How have things changed between 1870 and today?</p>	<p><b>Research through objects</b></p> <p>The museum has objects that belonged to the navvies.</p> <p>Children can touch these items and read stories about navvies.</p> <p>Navvies had to travel for work and even though they were very hardworking, the local people were often suspicious of them.</p> <p>Put yourself in the shoes of a navvy working to create the Ravensglass and Eskdale Railway.</p> <p>Write a short blog about a day in your life.</p>	<p><b>Ingenuity (back in school)</b></p> <p>Compare the tools used by navvies with the tools used today (Crossrail Video at <a href="https://youtu.be/65ok77gPdXo">https://youtu.be/65ok77gPdXo</a>).</p> <p>What are the big changes in large engineering projects?</p> <p>Is all of the hard work carried out by people or machines?</p> <p>What about the size and scale of equipment?</p> <p>Write a short story about a day in the life of an engineer working on Crossrail. Then compare the two stories.</p>	<p><b>Plan</b></p> <p>Ask the children to make detailed plans for their exhibition. Use the background information and feedback from the visit for inspiration.</p> <p>What will the theme be? Which objects will they use to tell their stories? What sort of objects will they use? Old objects or will the children create items to display?</p> <p>How will they gather information and objects (friends and families)?</p> <p>How will they let people know about their display?</p>

## Supporting information for teachers

### 1873 - The story of Navvies

Ravenglass and Eskdale Railway was built in 1873, and first opened on 24<sup>th</sup> May 1875.

Here is an extract from the Whitehaven News from 23<sup>rd</sup> November 1876:

*Whitehaven News, 23<sup>rd</sup> November 1876 – ‘The long talked-of Ravenglass & Eskdale Railway was opened for passenger traffic on Monday last. The first train, gaily decorated with flags, left Ravenglass at 8:35am, stopping at all stations and reached Boot, the Eastern terminus of the line, at 9:20am. Lord Muncaster, MP, the Rev H.Bell, Mr J.Ross and several other local gentlemen accompanied the train, Lord Muncaster riding upon the engine. A service of trains in connection with the trains on the Furness Railway is now running regularly into Eskdale. It is hoped that this little enterprise will be a means of bringing a large number of visitors to the truly beautiful valley of the Esk. We may add that the district was quite en fete over the event, flags being displayed at Ravenglass and various places along the line. In one instance, viz, that of Mr Vicars, Gill Bank; the flag was hoisted on the top of a high cragg known as ‘The Burrows.’*

In the 1870s the demand for iron ore for Victorian construction projects was at its peak. Although there have been records of haematite (iron ore) in the Esk Valley since Roman times, it had only ever been smelted from time to time. In 1871 the Whitehaven Iron Mines Ltd was set up to mine in the area.

The Ravenglass and Eskdale Railway was built to transport iron ore from the mines above Boot and bring it to the main-line railway at Ravenglass. The Railway had permission to create a track no smaller than 2 ft 9 inches around (83 cm). The decision was taken to build the railway to a gauge of 3 ft, (91.44 cm).

Navvies built the line. ‘Navvies’ were named after the navigations (canals) they built. In the 1800s canals were the equivalent of motorways; a way of transporting goods quickly and cheaply. When the railways came, they gradually put the canals out of business.

Navvies were economic migrants of their time, many coming from Ireland. Life in Ireland was tough particularly for people who relied on farming or agriculture to make their living. Even before the potato famine in 1845, people were leaving Ireland in search of a better life.

The work of a navvy was tough. They didn't have the modern day tools we have today. They used pick axes, shovels and wheel-barrows to physically cut and lay the railway tracks. It was back-breaking, dangerous work.

Fifty navvies started to work on the Ravenglass railway in February 1874 and had laid the whole seven miles of track by April 1875.

Use the background information to explain that you are going to look at, and create a display about, the lives of the Navvies who built the railway.



This photograph is the only known photograph of the workers who built the railway. It shows a gang of Navvies under the bridge at Irton.

Compare this picture with a modern day engineers as shown in the video clip and information available at:

- Crossrail construction video clip at: <https://youtu.be/65ok77gPdXo>
- Examples of current-day engineers and role models, see Tomorrow's Engineers web site: <http://www.tomorrowsengineers.org.uk>

What do the children notice that is similar and different?

Prompt them to look at clothes, equipment and the work environment.



Session 2: A day in the life of a steam engine driver				School or railway
This session is based on an interview with an engine driver at the Ravenglass and Eskdale Railway. It can be used in the classroom. Equally children could arrange to conduct their own interviews with staff on site, by prior arrangement. (KS2 but suitable for KS1 if meeting driver on-site who can simplify answers)				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>Today children are going to find out what it is like to work at the Ravenglass and Eskdale Railway. There are full-time and part-time jobs and lots of people volunteer their time.</p> <p>Some children may have family members who work at the railway.</p> <p>Use the interview with Anna Tilsley to explore some of the jobs involved.</p> <p>Team read the interview or read in role with one person asking questions and the other being Anna.</p>	<p><b>Ask</b></p> <p>What is Anna's job now?</p> <p>What does she do when she first arrives at work?</p> <p>Why does she have to set a fire in the engine?</p> <p>How long does it take for the engine to build up pressure?</p> <p>Which roles has Anna already carried out?</p> <p>Which job does she want to do?</p> <p>What does Anna like about the railway?</p>	<p><b>Design project</b></p> <p>Anna would like to see many more young people volunteering at the railway and museum. She would like the children to design a poster or an advertisement to encourage young people to volunteer to help at the railway.</p> <p>What sorts of images would you use?</p> <p>What sorts of words? See KS1 Word Bank</p> <p>See PPT of photographs and old posters to use as inspiration.</p>	<p><b>Interview</b></p> <p>Ask the children to prepare interview questions to find out about the jobs that people do at the railway but also perhaps around school or at home.</p> <p>Encourage them to think about :</p> <p>The sort of questions to ask</p> <p>How to record answers (the interviewer recorded Anna's replies on a smartphone)</p> <p>How they will write up the interviews and how they will share what they have learned with classmates.</p>	<p>Ask the children conduct their interviews and then report back. – hot seating with Driver</p> <p>Can they provide a short report on What it was like to interview someone.</p> <p>What they learned.</p> <p>What they might do differently next time.</p>

## Supporting information for teachers

### A day in the life of a steam engine driver

This interview with Anna Tilsley may provide inspiration for a thematic study of the types of jobs at the railway, how roles have changed over time, or women working on the railway. The museum has more information on these topics.

The early images of the Ravenglass and Eskdale Railway show mainly men working on the railway. This is no longer the case. There are three women engine drivers and women have other prominent roles such as guard, engineer and stationmaster.

Anna has worked her way up from volunteer to driver and hopes to continue to train and learn new skills that will allow her to go on to manage the railway.



*Engine driver, Anna Tilsley*

## **Interview with Engine driver, Anna Tilsley**

### **What do you do on a typical day?**

I'm currently a full-time steam engine driver. I light up the engine first thing in the morning, at 8 o'clock.

Set the fire in the engine to build up steam pressure. That takes a couple of hours.

While that is happening I polish and clean the engine before driving the train up the valley.

Each day I can do two or three round trips and then I get back and do all the shed jobs in reverse.

I make sure the fire has died down enough, clean out the smoke box and then polish the engine again.

I also paint the coaches throughout the winter. So when we are doing winter maintenance I'm in the paint shop and that's pretty much what I do.

### **What attracted you to this job?**

When I came here I wasn't massively into trains. My father and brother were, though largely interested in mainline railways but I really enjoy it. I think the things that make it good here are the location and the people. I'm really good friends with all the other staff and really enjoy it. I started volunteering as a guard, and then got a paid job on the operations side, being a stationmaster and guard, things like that. Next I did a season in the booking office and now I'm driver so I've done a bit of everything really.

### **Are you the only female in those roles?**

I'm the only female driver. We've got two volunteer diesel drivers that are female but I'm the only full-time female member of staff on the operations side.

### **So how would you encourage other girls (or anyone) into this role?**

I think it's important to make it clear to anyone that it's not just the stereo-type that you think of; men with beards driving steam engines. It's not that any more. We actually have a lot of female guards who volunteer so it's about getting across that we do have a wide range of people and a wide range of ages from 16 to 70 volunteering, male and female.

I think a lot of people are put off because we do have more men and it can be a bit intimidating. When I started there weren't that many girls and I was quite intimidated by it. So it's about making people aware that there are girls here and we stick together. We are better at it than boys anyway!

### **Would you encourage girls to volunteer?**

Absolutely, there's no reason girls can't do it.

I've always been into science and I go over to the engineers' workshop whenever I can and try to get a bit more of an understanding about the engineering behind it.

### **Where do you want to go from here?**

I'd quite like to work my way up to jobs in management; controlling the railway and the signal box. I'd quite like to move on to those but for now I'm happy driving.

### **It sounds like a great job, it's outside, you get to meet people, proper start and finish process each day...**

I didn't want to leave the area because I love it so much here. So I set my heart on learning to drive and it's taken me a few years of working up through the different jobs.

### **Interview techniques**

Museum staff are happy to be interviewed by prior arrangement. Ask the children to think of questions for interview. What would they like to know about life at Ravenglass Railway Museum. What sorts of questions should they

ask in interview? (Open or closed etc). Put together a list of the ten best questions that will make the best interview. Ask the children to interview each other to test how well the questions might work. What could they improve in planning their interview questions?

How will they record their answers (video, sound file, making notes)? What are the pros and cons of these methods?

## **KS1 Word Bank for Volunteering Poster**

### **KEY WORDS**

- get involved
- help out
- meet new people
- fun
- learn skills
- address, email, phone number

### **THE POSTER SHOULD BE**

- bright
- colourful
- eye-catching
- exciting

### **JOBS**

- driver
- guard
- engineer
- trackwork
- museum
- volunteer

### **QUESTIONS**

- what is there to do?
- how do I get in touch?

Session 3: The remarkable Mary Fair				School and museum
<p>In this session children explore the archive material provided by Mary Fair. Mary Fair was an adventurous Edwardian photographer and writer. She has left the museum with photographs documenting the social history of the railway and the valley.</p> <p>This activity is also suitable for Arts Award Discover and Explore.</p>				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>Use the background information to introduce Mary Fair.</p> <p>Invite children to look at different sources of information about Mary (PPT, background information, obituary).</p> <p>What is different and what is similar about the pieces of writing?</p> <p>Are there any difficult words in either piece of writing?</p> <p>Which gives the clearest picture of Mary?</p>	<p><b>Pen portrait, artistic impression</b></p> <p>Using the information they have from both the background information and the obituary ask the children to write a short description of Mary or draw a picture of Mary.</p> <p>Invite the children to share their (pen) portraits.</p> <p>Next share the PPT.</p> <p>Did their description accurately reflect Mary?</p> <p>What, in their opinion, is the most powerful source of information about Mary?</p>	<p><b>Research</b></p> <p>Invite the children to carry on their research about Mary Fair using the objects and records at the museum. There is a display at the museum and a suitcase containing objects that may have belonged to Mary. Use these in an object handling session.</p> <p>Ask the children to select a story they would like to tell about Mary, inspired by her photographs or articles. Make notes about this story.</p> <p>Mary used the pen name Silverpoint, ask the children to choose a pen name.</p>	<p><b>Journalism or blog writing</b></p> <p><b>At the museum</b></p> <p>Mary Fair promoted the Eskdale Valley in many magazines and newspapers.</p> <p><b>Activity</b></p> <p>Ask the children to choose a photograph by Mary Fair and write an article (KS2) or caption (KS1) for a newspaper based on the photograph.</p> <p>To plan (KS2), ask them to think about</p> <ul style="list-style-type: none"> <li>• What is the purpose of their article</li> <li>• Who will read it</li> <li>• Three facts</li> <li>• An alternative headline.</li> </ul>	<p><b>Presentation</b></p> <p>The children now have a lot of information about Mary.</p> <p>Can they plan an assembly about Mary to share their knowledge about this local character with everyone else in school?</p> <p>Research task - can they think of other local characters they might like to investigate?</p>

## Supporting information for teachers

### The remarkable Mary Fair (1875 to 1955)

The 400 photographs taken by Mary Fair have provided a great legacy for the Ravenglass Railway Museum. Her photographs show what life was like for people living in the valley between 1900 to the 1940s.

We know very little about Mary Fair's early life. She moved to Eskdale in 1903 aged 29, to be with her mother whose health was failing. Her father was the vicar in the valley.

As a young woman, Mary trained in medical science and was one of the first women to become a specialist in X-Rays and radium science. Later in life she suffered as her hands were scarred from working with radiation. During the First World War she worked at University College Hospital, London.

Mary developed an interest in photography in the 1890s, using one of the first folding cameras made by Kodak.



Over 50 years, she photographed every aspect of life in Eskdale. She often sold her photographs to magazines and newspapers, generating publicity for the area. Mary also wrote many articles and guides about life in the Esk Valley, including a vivid description of the 3ft gauge Ravenglass and Eskdale Railway, 'A Railway in Chancery' which appeared in 'Wide World' magazine in 1903. She often published under a pseudonym, 'Silverpoint' and she even wrote a series of detective novels under the name 'Donald Deane'.

The Ravenglass and Eskdale Railway ran very close to Beckfoot Rectory where Mary lived for a short time and it was a favourite subject to photograph.

Mary had an adventurous spirit. She drove her 1926 Trojan Tourer car all over the fells. She would even drive over Hardknott Pass near Boot. This was the steepest road in England at a time when roads were little more than cart tracks. She also travelled in Europe, serving as semi-official ship's medical officer on a cargo ship.

A keen archaeologist, she was actively involved in digging and recording Eskdale's past, and from the 1930s appeared on BBC radio discussing history and traditions in the Esk Valley.

Mary has left great photographic record along with articles documenting life in the valley. She was a strong personality and a true adventurer.

Mary's work is available to look at in both the museum and the archive.

## **Obituary**

When Mary Fair died in 1955, Lord Rea of Eskdale provided obituary for the Whitehaven Times (17<sup>th</sup> February 1955).

An obituary usually appears in a newspaper when someone dies and it includes a short biography or description of someone's life.

Archaeologist, welfare-worker, explorer, genealogist, naturalist, photographer, writer and lecturer... this familiar and friendly figure, sometimes half-tramp, sometimes professorial, trudging up the fells in foul or fair weather to deliver orange juice or medicinal oil out of her knapsack to some infant arrival in a remote farmhouse; or, at midnight, popping up disturbingly from behind a beck-side drystone wall, where she had been recording the seasonal note of an unusual owl... we shall miss her friendly, twinkling eye, her crisp opinions – sometimes inventively ornamented and not infrequently critical – but particularly we shall miss her humanity; her readiness to give a knowledgeable hand wherever it was needed.



## **Primary and secondary sources**

The pieces of writing are examples of primary and secondary sources. Which is which?

One is a primary source (the obituary written by someone who knew Mary at the time of her death) and the other is a secondary source (the background information was written recently and pulled together from different primary and secondary sources).

Mary's photographs often appeared alongside her written articles about Eskdale. Ask the children to research online websites or publications that promote the Western Lakes. Ask them to write an article that could be published on one of these sites about the Ravenglass and Eskdale Railway. It could be about the museum; it could be comparing Mary Fair's work with the children's work publicising their local area or it could be about the Energy Coast.

<http://www.eskdale.info>

<http://www.golakes.co.uk/explore/western-lake-district/?AskRedirect=true>

## **More about Mary Fair**

There is more information about Mary Fair at the museum. There are:

- Interpretation panels
- Photographs on display
- Photographs, magazines and other writing in the archive.

Session 4: Ratty People Saving the Railway				School and museum
The very survival of the Ravenglass and Eskdale Railway has been threatened at many points in its history. In 1960, the local community rallied to preserve the railway and it is because of this local enthusiasm that the railway exists today. In this session we look at community and the strength of working together. Ties to SMSC learning				
Introduction	Carousel of Activities			Share
<p><b>Explain</b></p> <p>The children will explore the history of the Ravenglass and Eskdale Railway. They can visit the museum and they can use the timeline and their own research. The railway has had a precarious history and there are several dramatic events and periods that will capture the children's interest.</p> <p>Give children a series of facts about the railway and get them to put them in order on a line (washing line and pegs).</p> <p>Ask the children to choose a part of the story they would like to investigate.</p>	<p><b>Early history</b></p> <p>Early in the history of the line, workers were needed both to build the railway and to mine the iron ore. Both of these jobs were highly dangerous and unpleasant.</p> <p>Look at the archive material about the families of these workers.</p> <p>Ask the children to write a short story imagining what life was like for the children of these families.</p> <p>How might children welcome these children today? What could they do to help them?</p> <p>Write a postcard or send a tweet to make these children feel welcome.</p>	<p><b>W. J Bassett Lowke</b></p> <p>Bassett Lowke saw the potential to use the railway to experiment with his ideas to make and improve steam engines. What might the problems be? How would children persuade the public to use the coaches pulled by miniature locomotives? Design an advertising campaign to get local people back on the Ratty.</p> <p>Think about the principals of Marketing:</p> <p>AIDA</p> <p>Awareness, interest, desire and action.</p> <p>Also think about Product, Place, Price and Promotion and the people who they are wishing to attract.</p>	<p><b>Saving the railway</b></p> <p>Ask the children to put themselves in the shoes of Douglas Robinson. How would they go about saving the railway? Today we have social media, great communications and news media. Douglas had very limited resources.</p> <p>Invite the children to think of ways of fundraising for a good cause. They can choose the cause. It could be a local charity, a national charity event or something else.</p> <p>Ask them to choose and plan a fundraising event.</p> <p>Can the children think of enterprising ideas that could be used at the museum?</p>	<p><b>Presentation</b></p> <p>Use the script of the auction to act out the fateful day when the railway was saved. Children can dress up and act in character. Ask them to rehearse. They may be able to present their drama at the museum.</p>

## **Supporting information for teachers**

The history of the line provides an opportunity to teach chronology. This is a very difficult task for teachers of particularly young children. The collection of model locomotives and toys might be a useful way in to chronology for very young children. What sorts of toys might they have played with at different ages, etc.

The history of the line is provided here in chronological order. The information can be cut up to create key events in a timeline of the Railway's history, using the first paragraph.

### **Timeline**

#### **1873 -1876 Building and opening of the railway**

Ravenglass and Eskdale Railway was built in 1873, first opening on 24th May 1875.

In the 1870s the demand for iron ore for Victorian engineering and construction projects was at its height. There was a long history of iron ore being smelted in the Eskdale valley, back to Roman times. In 1871, Whitehaven Iron Mines Ltd decided to mine the area for ore. The Ravenglass and Eskdale Railway was built to transport iron ore from the mines above Boot and bring it to the main-line Furness Railway at Ravenglass.

#### **1876 -1912 Difficult early years**

The line opened for goods in 1875 and, after being inspected and passed as safe by the Board of Trade, for passengers in Nov 1876. Unfortunately the iron ore being mined was low-quality and, together with unpaid bills from the railway's construction, forced the line into bankruptcy in 1877.

The receivers continued to run the railway with minimum repairs and investment being made, and although the iron ore mines closed in 1884 the line became a popular tourist attraction.

In 1908, once again, it was considered to be unsafe for passengers and could only carry goods. One of the iron ore mines re-opened to try and provide work for the line

## **1913 Running out of steam**

In 1913, the Nab Gill Mines flooded and the railway and its locomotives finally ran out of steam.

### **Key people**

Both the building of the railway and the purpose of the railway (transporting goods from mines) attracted people from Ireland and Cornwall. The people in Ireland had faced very hard times and often migrated for work so that they could support their families. In Cornwall the tin mines were closing but Cornish tin miners had the skills needed to mine iron ore. The archive has tragic stories of the plight of some of the families that migrated to the area for work.

## **1913-1920s Invention and ingenuity**

Even though the railway closed in 1913, this wasn't the end of the story.

W.J. Bassett Lowke found out about the railway. He was a miniature railway engineer and saw the line as a great opportunity to test his locomotives.

He visited the railway in June 1915 and within two weeks bought the lease and began regauging the railway to make it suitable for his work. Work continued on the line, despite the outbreak of the First World War.

Local passengers were amazed that they were being transported by scale models of locomotives such as the Sans Pareil.

The line extended and its activity expanded through 1920s.

### **Key people**

WJ Bassett Lowke, station staff.

Sir Aubrey Brocklebank, Director of Cunard shipping line and a local railway enthusiast funded the building of a new locomotive in 1919 and in 1922 was a founder of the Beckfoot Quarry Company which used the little railway to move granite to the main-line railway at Ravenglass and provide local employment.

## **1925 – 48 A change of management**

A change of management to Beckfoot Quarry Company saw the development of granite traffic and a lot of investment in new track, buildings, and locomotives and carriages.

More passengers used the line and it became profitable again. Operations on the line were suspended during the Second World War. **Key people**

Mary Fair, social history of area.

### **1953 – 1960 Railway in danger again**

During this period the railway only transported passengers.

However, the 40,000 passengers using the railway during the summer months was not enough to keep the railway going. The railway was in danger of being sold to a scrap merchant.

### **1960 Saving the railway**

Douglas Robinson, clerk of Muncaster Parish Council, worked tirelessly with others to gather donations from local people and people living further afield to save the railway.

This fundraising effort led to the founding of the Ravenglass and Eskdale Preservation Society. The campaign made the news, even appearing on the BBC but the funds gathered did not reach the £14,000 needed. The enthusiasm to save the railway attracted the attention of Colin Gilbert and Sir Wavell Wakefield MP. They had a business interest in what is now known as Ullswater Steamers. They bought the railway for £12,000. The railway is still owned by the Wakefield family.

Assembled from eye-witness accounts and contemporary newspaper reports.

TERRY HODGSON – (AUCTIONEER FROM KENDAL)

Good afternoon, this is a unique sale and a unique occasion when a very wonderful part of West Cumberland is to be sold. The Keswick Granite Company has already received offers of four thousand pounds for the track of the Ravenglass and Eskdale Railway, and two thousand for the ten cottages. I will begin by offering lots one to sixty as a going concern, but if no bids are made I shall offer each lot separately. Lots one to sixty then, the bidding starts at ten thousand pounds. Do I hear ten thousand?

DOUGLAS ROBINSON

(BIDDING ON BEHALF OF RAVENGLASS & ESKDALE RAILWAY PRESERVATION SOCIETY)

Ten thousand

UNKNOWN BIDDER

Eleven thousand

HODGSON

I have eleven thousand

ROBINSON

Twelve thousand

*Silence*

HODGSON

And advance on twelve thousand?

*Silence*

HODGSON

I will accept further bids of one hundred pounds

*Silence*

HODGSON

Very well, going once... going twice...

*Hammer*

...sold to the Ravenglass and Eskdale Railway Preservation Society

*Cheers*

## **Strong structures at the railway**

Children look at the design of strong structures and develop their understanding of how strong structures are used around the railway.

## **Strong structures presentation**

Before the visit, use the PowerPoint presentation to introduce children to the idea of strong structures. Teacher notes below the bridge-building challenge give additional information.

## **Strong structures around the railway**

While children are visiting the railway, they should observe the buildings, carriages and other structures to observe how they are constructed for strength. It demonstrates the real-life application of materials, design and construction.

If available, children can take digital images of the strong structures and use these to produce a presentation or discuss the structures back in school. Some structures that the children may identify include:

Posts with supports and beams carry the platform canopy roof, which in turn is made from beams joined as triangles.



Beam bridge which carries the railway.





Arch over doorway.

'Flattened triangles' making up the picnic benches.



Railway tracks are made from strong iron and laid on sleepers to take the weight of the trains.



Footbridge over the mainline tracks show triangles making up a beam and a central supporting post.





Session 1: Strong structures at the Ravenglass and Eskdale Railway				School, museum and railway
This session links some pre-visit activities with activities when the children are at the railway station.				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>Before the visit, use the PowerPoint presentation to introduce children to the idea of strong structures.</p> <p>Teacher notes below the bridge challenge give supporting information.</p>	<p><b>At the railway</b></p> <p>While children are visiting the railway, they should observe the buildings, carriages and other structures to observe how they incorporate strong designs and construction. It demonstrates the real-life application of materials, design and construction.</p> <p>If available, children can take digital images of the strong structures and use these to produce a presentation or discuss the structures back in school.</p>	<p>Look for examples of arches, triangular structures, beams and the use of strong materials such as iron. How do these structures and materials relate to the job they are performing?</p> <p>Why have the materials been chosen?</p> <p>In the museum, look at the bridges exhibit. Use the blocks to build an arch. Note how the structure is only stable when the final keystone is in place.</p>	<p><b>Resources</b></p> <p>Strong structures PowerPoint presentation</p> <p>Strong structures worksheet</p> <p>Digital cameras if available</p> <p><b>Safety</b></p> <p>Produce your own suitable risk assessment but in addition, remind children not to stray from designated paths and platforms when looking for strong structures. Supervise as appropriate at all times.</p>	<p>Children can share their digital photographs and explain why the structures they have found are strong. Have children explain in terms of the structures and also the materials used. Link this to the purpose of the structure.</p>

# Strong structures at the railway

Can you find the strong structures?

Make a list of the structures you find.  
What materials are they made from?  
Explain why they are strong.



Stay on the platform and paths. Listen to what your teacher tells you to do.

## **Bridge-building challenge**

In this session, children develop their design, build and test skills as well as gaining an understanding of forces. Children build a bridge using craft straws and connectors and test the strength of their bridge.

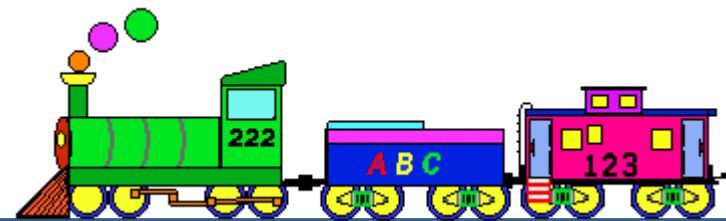
It is advisable to give the children plenty of time to experiment and try different approaches as well as the time needed to build their bridge.

Session 2: Bridge-building challenge				School
Children are challenged to build a bridge to span a gap. The bridge is made of commercially-available craft straws with connectors. Alternatively, drinking straws and sellotape could be used.				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>Use the presentation to highlight and describe the different types of bridges. Supporting notes are given below.</p> <p>Introduce the idea of building bridges to span gaps.</p>	<p><b>Ask</b></p> <p>What bridges do the children use? Do they notice bridges as they cross them?</p> <p>What would it be like without any bridges in Cumbria?</p> <p>How would it affect them getting to and from school and visiting friends and family?</p>	<p><b>Build</b></p> <p>The challenge is to build a bridge to span a gap (see final slide of the presentation).</p> <p>Choose an appropriate span, depending on the materials available and children's ability. This could be between two blocks, books or two tables positioned a distance apart.</p> <p>The bridges will be tested using a plasticine weight, placed in the centre of the bridge, to see how the different designs perform. For context, if possible use a model train, weighted with plasticine.</p>	<p><b>Resources</b></p> <p>Craft straws and connectors or drinking straws and sellotape.</p> <p>Bridges presentation and children's sheet (below).</p> <p><b>Safety</b></p> <p>Produce your own suitable risk assessment. In this case, if scissors are used, remind children of their correct use.</p>	<p>Children test their designs. This can be used as a basis for a report to Ratty on the best design.</p> <p>Which features worked well and which features not so well? How can their design be improved? Have children think about how bridges on the railway or ones they see every day have similar design features.</p> <p>To extend the activity, measurements of weight and the sag of the bridge could be made and put into a table or used to produce a graph.</p>

# Bridge challenge

Can you help me build the best bridge?

Design, make and test a bridge to allow the train to cross the gap.



## Supporting information for teachers

### Activity: Design, build and test a craft straw bridge

This activity can take some considerable time and the children will benefit from being able to make, test, redesign, remake and retest their structures. Some ideas and designs may be successful but equally, children can learn from those which are not so good.

After dividing the children into groups, it would be good to have a 'paper design' stage in which groups discuss and produce some form of drawing to show their proposed design.

On completion of this design phase (and any necessary revisions), give children their allocation of craft straws, connectors and sellotape.

Groups can then build, test, modify and develop their designs.

Test the bridges using plasticine weights and see if bridges can support a block placed in the middle of the span. Successful designs will take the weight. The weight is the force of gravity pulling down on the object and this is what the bridge needs to withstand. For a more realistic context, use a model train, weighted with plasticine as appropriate.

### Strong structures and bridges background information

Strong structures tend to have shapes that incorporate triangles, or shapes based on triangles. A simple example is a bicycle frame. It is made up of two triangles joined together.



Triangles can be seen in these lamp posts. Look for similar structures at the top of the posts that support the platform cover.



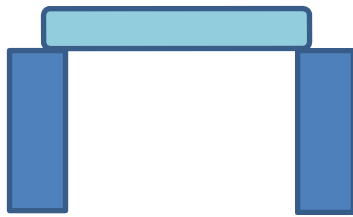
Engineers take into account a number of factors when designing a bridge. They consider:

- The load (weight) it has to carry,
- Its span (the distance it has to cross)
- Materials to use
- How to make it stable so it doesn't move about in high winds for example.

There are four main structures for bridges

- Beam
- Arch
- Cantilever
- Suspension.

### Beam bridges



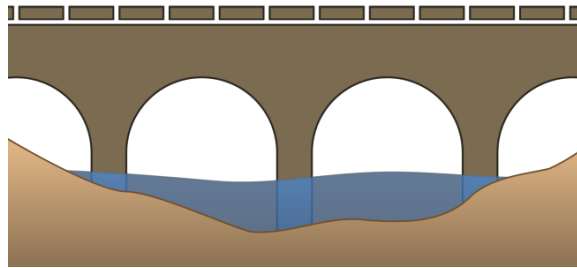
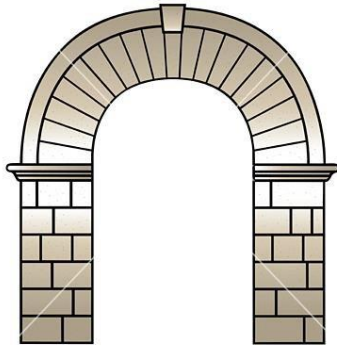
As a load crosses a beam bridge its weight presses downwards. If too much weight is put on the beam it will sag in the middle. Most beam bridges are no more than 60 metres in length.



### Arch bridges

The Romans invented a type of cement that allowed them to bind stones together and form a concrete-like material. This invention meant they were able to build very large arch bridges.

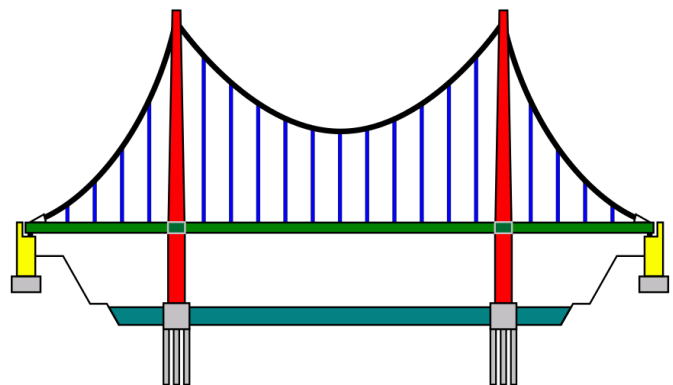
Every arch bridge has a keystone at its midpoint. This keystone makes each stone in the arch press against its neighbours and so gives the bridge its strength. A series of arches are linked together when the bridge spans long distances.



The force is carried outward along the curve to the supports at each end. The supports, called abutments, push back on the arch and prevent the ends of the arch from spreading apart.

### **Suspension bridges**

In suspension bridges the deck hangs from cables from towers or an arch. In the nineteenth century, iron chains were used to construct suspension bridges. Now they are made of cables composed of thousands of steel wires. Suspension bridges can span large distances.



### **Engineering web links**

The Institute of Engineering and Technology (IET) teachers section  
<http://www.theiet.org/resources/teachers/index.cfm>

Faraday schools' web site (The Institute of Engineering and Technology)  
<http://faraday.theiet.org/>

Tomorrow's Engineers (careers information)  
<http://www.tomorrowsengineers.org.uk>



## Theme 3: Energy and power

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### Introduction

This topic allows children to explore energy and power in the context of generating movement on the railway and also the generation of electricity in Cumbria. By widening the topic, it allows children to consider issues such as the history of power generation, sustainability, their own use of energy and the environmental impacts of power generation.

## **Energy in the Esk Valley: video presentation**

This activity, in addition to learning about history, science and geography, will give children the opportunities to work collaboratively, develop skills in team working, organisation, leadership, presentation, problem solving and negotiating.

The Esk Valley and West Lakes is a living timeline of energy production from Eskdale Watermill at the top of the valley, through steam power, nuclear power and on to renewable energy in the form of solar and wind turbines.

Records show that a watermill was already established in Eskdale in 1294. It is believed the current buildings have been on site since 1578. The energy industry has brought jobs and hi-tech industries to the area but can be controversial in terms of its impact in such a beautiful part of the world. Children's parents, carers or family members may be employed in the energy industries or they may be worried about further developments and the impact on the natural environment.

These resources focus on the community display area in the Ravenglass Railway Museum. This section supports local schools to explore the stories of energy and to present ideas in a video to display at the museum. The videos can be as simple as exploring a timeline of energy, looking at the pros and cons of different types of energy or explaining how different types of energy can be generated.

These websites may be of interest:

- Industrial history of Cumbria  
<http://www.cumbria-industries.org.uk>
- Sellafield has a bank of information aimed at schools  
<http://sustainability.sellafieldsites.com/resources/energy-coast>
- Britain's Energy Coast  
<http://britainsenergycoast.co.uk>

Also useful in terms of searching online for research, is NSPCC's guidance on staying safe online, available at their web site:  
[www.nspcc.org.uk/preventing-abuse/keeping-children-safe/online-safety/](http://www.nspcc.org.uk/preventing-abuse/keeping-children-safe/online-safety/)

Session 1: Making a video - research				School
The aim of these sessions is to research the importance of energy to the local area. The children will do this by making a short video using tablets.				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>The area is known as Britain's Energy Coast. The museum would like the children to create a short video about the different types of energy in the Esk Valley and the West Lakes.</p> <p>Working in groups of 4 or 5, start by asking the children what they already know about different types of energy made in the valley. If they struggle with this, suggest walking through a day and looking at where they use energy.</p> <p>Ask them to list the different types of energy.</p>	<p><b>Sources</b></p> <p>How can the children find out more about different types of energy?</p> <p>Ask them to list potential sources of information.</p> <p>Explore the children's ideas for sources of further information.</p> <p>Discuss primary and secondary sources.</p> <p>Discuss how to check sources.</p>	<p><b>Further research</b></p> <p>Ask the children to plan how they will research the subject so that they have enough information to make a short film.</p>	<p><b>Information Technology</b></p> <p>Explain how the technology works, showing the main features of videoing, green screen etc.</p> <p>Give the children the tablets and let them play with the video function until they are confident. Allow the children time to experiment with green screen doing short pieces to camera.</p> <p>They can upload their videos to sharing apps approved by the school such as Showbie.</p>	<p><b>Next steps</b></p> <p>At the end of the session make sure the children have a plan. This should include a subject or working title for their video</p> <p>Allocation of roles: presenter, script writer, camera operator or they could share all of these roles)</p> <p>Ideas on how to gather content</p> <p>How they will plan the video (storyboard and script)</p>

## **Supporting information for teachers**

The museum has an extensive archive. This is an opportunity to discuss sources in some detail. With the Internet providing so much information it is very important for children to understand what might be a reliable source and what might be an unreliable source.

The archive at Ravensglass Railway Museum contains historic documents, photographs, posters, diaries, records and paintings.

These are generally primary sources, created at the time of an event. For example one of Mary Fair's photographs is a primary source, however a biography written about Mary Fair today would be a secondary source. All researchers have to check their sources carefully for accuracy and authenticity. Anyone can put anything online and it doesn't have to be accurate so researchers have to be very careful to find sources they can trust.

Discuss the main ways to tell if a website is authentic. Sites that end org.uk or gov.uk tend to be good sources of information. For the purposes of this project use an online app such as Showbie so that the teacher has complete control over what the children can search. Talk about which images are safe to use in terms of copyright issues. If using Google Images for example, click Tools, this will bring up a menu which includes Usage rights. Children should only use images 'Labelled for reuse' otherwise they will infringe copyright law.

Populate Showbie with photographs, text and documents that are safe for children to look at.

Discuss how children will gather information. If they are going to speak to people working in the industry, what sorts of questions might they ask? Will they record the interview on video? Will they report what the interviewee said?

Session 2: Making a video - planning, creating content and creating a storyboard				School
The aim of these sessions is to research the importance of energy to the local area. The children will do this by making a short video using tablets.				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>Now that children have a plan, they can put it into action.</p> <p>The first thing to do is focus on the main themes and topics that they need to research.</p> <p>They can now gather more information. This may be by inviting speakers into school and arranging interviews, talking to family and friends, looking online at suitable sources or contacting local companies. We have provided basic information to act as starting points.</p>	<p><b>Storyboard</b></p> <p>When they have enough information on their topic that is reliable, the children start to put this information into a storyboard.</p> <p>Now they can write the script.</p> <p>This should include stage directions about what will happen in the scene and the words to be spoken.</p> <p>The children should also think about how the presenter will read the script. Suggest large text on sheets that can be easily read from a distance.</p>	<p><b>Setting the scene</b></p> <p>Let the children then experiment with filming, reading scripts, presenting.</p> <p>They can refine their ideas until they are ready to shoot their video.</p>	<p><b>Plenary</b></p> <p>Share the work from the session and ask for feedback from the other children.</p> <p>Ask what worked for them and what might be improved.</p> <p>Keep the feedback constructive. Ask children to suggest ways to improve rather than simply pointing out things that haven't quite worked.</p>	<p><b>Next steps</b></p> <p>Armed with this feedback children can now plan their final shoot.</p> <p>In the next session suggest they have a final run through before filming.</p>

Planning is crucial to success when creating a video. Most professionals create a storyboard.

A storyboard allows children to draft out ideas for scenes along with any text to go with images.

The format is very simple. The children should plan no more than five scenes.

<b>Scene 1</b>	<b>Scene 2</b>	<b>Scene 3</b>
<b>Overview</b>	<b>Overview</b>	<b>Overview</b>
<b>Script</b>	<b>Script</b>	<b>Script</b>

Using their research findings, children will write scripts for their videos. A script should be structured around an introduction, a description/representation of energy in the area, and perhaps a view of the future of the area. These can be presented in the video using green screen, animations, and other means. Start to establish the apps that the children can use in their films.

Session 3: Making a video – filming and editing				School
The aim of these sessions is to research the importance of energy to the local area. The children will do this by making a short video using tablets.				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>The final session is for children to refine their videos and think about what they want them to look like.</p> <p>The films can be edited using iMovie, Windows Movie maker or similar. Children may well be familiar with these software packages.</p> <p>Explain how the editing tool works.</p> <p>Explain how to add music.</p>	<p><b>Refining</b></p> <p>Give all the children time to work on their videos, to refine them until they are happy.</p> <p>Next invite the children to share their videos with the class for constructive feedback before any final edits.</p>	<p><b>Celebration</b></p> <p>A great way to end a video project is to have a premier where family and friends are invited.</p> <p>This allows family and friends to see their children's work and celebrate their achievements.</p> <p>One outcome may be to share the videos in displays at the Ravenglass Railway Museum.</p> <p>Invite staff from the museum to the premier.</p> <p>Award Oscars for best script, best film, best music etc.</p>	<p><b>Plenary</b></p> <p>There will be a lot of learning around this type of project.</p> <p>Allow children the opportunity to feedback on what they enjoyed, what they learned, what they would do differently.</p>	<p><b>Next steps</b></p> <p>The children can use their video making skills to create videos on a number of subjects linked to the area and the museum.</p>

## **Using energy: trains, turbines and power**

In this series of activities, children start to think about how a steam locomotive generates power to pull the train. They also consider where energy that they use comes from and research different methods of electricity generation.

### **Starting Synolda – a steam locomotive**

Children watch a short video that shows how one of the locomotives at the railway is prepared for use. After watching the video, children complete a card-sort activity to put the different parts of the process into sequence.

Two card-sort activities allow children to compare steam engines with petrol and diesel engines (internal combustion engines).



Session 1: Starting Synolda				School
Children look at a short video clip and then, using cards, define the sequence of events in the preparation and start-up of a steam locomotive.				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>Set the scene by telling children that the steam locomotives at the railway need to be started each morning.</p>	<p><b>Starting a steam engine</b></p> <p>Watch the short video clip (3 minutes) which shows Synolda, one of the museum's locomotives, being prepared, fired-up and driven.</p> <p>Have children work in small groups and complete the card-sort activity and put into sequence the process for starting Synolda and how a steam engine works.</p> <p>What fuel does the steam engine require? Why does the engine need water as well? Could the engine run if either of these ran out?</p>	<p><b>How steam engines and petrol engines work</b></p> <p>Complete the card-sort activity that shows how a combustion engine is fuelled and works. Compare with a steam engine.</p> <p>Whilst children may not have any experience of these, the cards are devised so that they can have a good attempt at getting the sequence correct by reading the information and thinking logically.</p> <p>Have children compare the similarities and differences between steam engines and a petrol (or diesel) engine.</p>	<p><b>At the railway</b></p> <p>Synolda, the locomotive in the video, will be on display in the museum. Use this, and the interactive that explains how a steam engine works.</p> <p>Have children observe the different types of train locomotives. Both steam and diesel locomotives are run at the Ravenglass and Eskdale Railway.</p>	<p>Pose a question for children to discuss in groups. Extend by having them produce a story that answers the question:</p> <p><b>What would your day be like if all cars, buses and vans were powered by steam?</b></p> <p>Children may consider the convenience of diesel or petrol engines over steam. Others may talk about air quality. We can 'see' smoke from a steam engine but not the emissions from petrol and diesel engines.</p> <p><b>What is a good power sources for transport of the future?</b></p>

## Starting and running a steam engine

Copy and cut out the cards. The sequence on the left describes preparing the boiler and the right column describes how the steam engine drives the wheels.

Check that there is water in the boiler and add water to the tank (tender).

The train driver operates the throttle.

Clear out the cold ashes from the firebox.

The throttle sends steam into the cylinders.

Light the boiler with a burning rag. Add wood and coal.

Steam in the cylinders push the pistons forward and back.

Coal burns in the boiler and heats the water. It gets very hot and the water turns into steam.

The moving pistons make the train wheels turn.

The hot steam builds up a high pressure. This can be used to drive the train.

The train wheels turn and push the train forward along the track.

## Starting and running a petrol / diesel car (internal combustion engine)

After the children have sequenced the starting of the steam locomotive, use these cards to do the same for a petrol / diesel engine (diesel locomotive).

Have children compare and contrast both processes. Which is quickest? Which is simplest?

Check there is petrol in the petrol tank before starting the engine.

The moving wheels push the car forward along the road.

Use the key to start the engine.

Petrol goes into the engine and into the cylinders.

Petrol explodes in the cylinders and pushes the pistons forward and back.

The moving pistons are connected to the wheels. They make the wheels move.

## **Locomotion and moving a train**

This activity can be used to revise forces and movement or introduce the idea that forces can change the movement of an object.

The context is the pulling force that the steam locomotive exerts on the train carriages it is attached to. The force will need to be enough to overcome the friction of the wheels and get the train increasing in speed (accelerating).

Children can also investigate the effects of the pulling force needed if the train is moving up an incline or down a descent (remember here that a braking force may be required). By adding plasticine (or similar), children can see the effect of changing the weight of the train as if it were loaded with passengers or empty.

The data gathered offers opportunities for the production of results tables, calculating averages and graphically presenting data.

## **Resources**

Attach a piece of string to a model train and attach the other end to a force meter (up to 5 newton should be sufficient).

Plasticine or other weights to be added to the train.

A piece of wood to act as an incline (alternatively add blocks under two legs of a table to produce a slope).

Session 2: Locomotion and moving a train				School and museum
Children use force meters to investigate the forces needed to move a model train over flat surfaces, inclines and descents.				
Introduction	Activities			Share
<p><b>Explain</b></p> <p>Ask children what they think causes a train to move. Have them consider the pulling force that the engine exerts.</p> <p>In pairs have children hold hands and gently exert push and pull forces on each other.</p> <p>How can we measure these forces? Introduce the idea of a force meter and demonstrate how one works.</p> <p>Remind children about the force of friction, which acts to slow down any movement.</p>	<p><b>Using force meters</b></p> <p>As a practice, have children attach string to the force meter and suspend a range of small objects to see what force gravity exerts on them (their weight).</p> <p>Have children suggest ways in which they could measure the pulling force required to move a model train.</p>	<p><b>Force and movement</b></p> <p>Children should work in groups of two or three.</p> <p>Attach the force meter to the front of the train and pull it at a steady speed across a surface. The observers read the scale to see the force. This is tricky and likely to lead to a lot of variation in results. Take an average. It is a good example of where observations need to be repeated to be reliable.</p> <p>Have children investigate, tabulate and report on how the force needed to move the train changes if its weight is increased, if it is pulled up a slope, or down a descent.</p>	<p><b>At the railway</b></p> <p>Look at the wheels on the locomotives and carriages in the museum. These help to reduce the rolling friction and so make it easier for the train to move.</p>	<p>Have children think about and discuss this problem.</p> <p>The wheels on the carriages and locomotive are designed to minimise friction (which slows them down).</p> <p>What problem does this make for the steam engine?</p> <p>Could the engine pull the carriages if there was no friction between its wheels and the rails?</p> <p>Sand is sometimes dropped in front of the driving wheels to increase friction and reduce them slipping.</p>

### **Which turbine is best?**

In this activity, children investigate how changing the number of blades on a turbine influences how well it turns. This is related to the generation of electricity from the wind turbines that children will have seen in the area.

A template is provided which can be copied on to thin card so that children can make model turbine blades. They will need to go on to an axle. Use a hole punch to produce a centre hole and a thin dowel to make the axle. Build up the axle behind the blades with sellotape so that the blades spin, rather than just get pushed back by the airflow.

Children can also experiment with different shapes of blade and can gain inspiration from windmill and blow-toys.

### **Safety**

A risk assessment should be performed before any practical activity. In this case, possible hazards include the use of a fan to generate the moving air. Make sure it has a guard and that children are instructed not to put fingers into the moving fan.

If a hair dryer or other form of heater is used, it should be set to blow cold air rather than heating up.

Session 3: Which turbine is best?				School
Children make turbines, with different numbers of blades, to see which spins the best in a constant flow of air.				
Introduction	Activities			Share
<p>Ask children if they have seen wind turbines and if they know what they are for?</p> <p>Relate the moving of the turbine to the generation of electricity. It is almost like an engine in reverse. Rather than taking in energy (coal / petrol) to generate movement, the turbines take movement from the wind and convert it into electrical energy.</p> <p>Set the scene that they are going to investigate the best number of blades for a model wind turbine.</p>	<p><b>Turbines and windmills</b></p> <p>If wind-powered toys are available, demonstrate how they are turned (powered) by moving air.</p> <p>Windmills have been used for centuries to harness the energy in moving air.</p>	<p><b>Investigating turbines</b></p> <p>Use the three-bladed turbine on the template sheet and have children make a wind turbine. Fold the blades back slightly along the dotted lines.</p> <p>Use a fan to see how well they work.</p> <p>What could children measure to be able to compare different designs of turbines to see which was the best?</p>	<p><b>Number of blades</b></p> <p>Use the single blades on the template sheet. Have children make up their own turbines with differing numbers of blades (glued or taped at the centre).</p> <p>How does changing the number of blades affect how well the turbine spins? Are there any patterns to their observations?</p> <p>For class results, different groups can be assigned different blade numbers to construct. If all groups use the same test and measurement (keep the same) then class results can be compared.</p>	<p>Turbines are a form of renewable energy.</p> <p>This activity can be part of the video-production activity or as a stand-alone activity.</p> <p>Working in groups, children research and explain forms of electricity generation.</p> <ul style="list-style-type: none"> <li>• Fossil fuel-powered stations (coal, oil or gas)</li> <li>• Nuclear power stations</li> <li>• Tidal power</li> <li>• Wind turbines</li> </ul> <p>Information can include how the power is generated, environmental impacts and the advantages and disadvantages of each form of generation.</p>

