

Overview

This unit of work involves children in designing, making and evaluating a canal bridge and/or an aqueduct. It explores the design and function of locks and a working boat lift, and challenges children to design an alternative structure to raise or lower boats from one level to another. Finally, it compares children's designs with the Falkirk Wheel, a state-of-the-art boat lift in Scotland.

Learning Objectives

To investigate the design problems encountered when building canals.
 To design, make and evaluate a canal bridge and/or an aqueduct.
 To explore how locks raise a boat from one level to another.
 To design, make and evaluate a lift for raising boats from one level to another.

The Curriculum

England: KS2 DT 1a,b,c,d 2a,b,c,d,e 3a,b,c 4a,b,c 5a,b,c

Scotland: Environmental Studies: Technology - Analysing, researching and planning; developing ideas and creating solutions; testing and evaluating.

Wales: KS2 Design & Technology 1.1, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 3.3, 3.6

Resources

The following WOW resources can be used to meet the learning objectives:

LO 1 Investigate the design problems encountered when building canals.

Use [Oxford Canal](#) to investigate the early development of canals and early solutions to the problem of steep gradients. (Early "contour canals" followed a winding route to avoid hills and valleys.)

LO2 Design, make and evaluate structures frequently found on canals.

(a) Design, make and evaluate a bridge over a canal.

Visit a local canal, if possible, to observe a variety of bridges. Evaluate the purpose, the users and the design of these bridges.

Alternatively, visit the [Canal Junction](#) website where there are photos of a variety of bridge types. Evaluate the purpose and design of these bridges.

Children can click onto [Bridges](#) to watch animations and find out more details about 4 types of bridges: Arched bridges, "Snake" bridges, Lift bridges and Swing bridges. Again, children can evaluate the purpose, users and effectiveness of each design.

Use [Bridge Building](#), a series of 6 lessons on designing and making a bridge across a canal.

As an extension activity, older or higher-attaining children might like to visit the American Public Broadcasting Service [Building Big](#) website. They could try the Craggy Rock Bridge Challenge and investigate bridge designs from across the world.

(b) Design, make and evaluate an aqueduct.

Investigate how early "contour canals" were shortened by building tunnels to cut through hills and aqueducts to span deep valleys. Use [Shorten It!](#) as a related mathematical activity based on the shortening of the Oxford Canal.

Visit an aqueduct on a local canal, if possible, to observe and evaluate its purpose and design.

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Resources

Use [Pontcysyllte Aqueduct](#) or [Three Aqueducts](#) (Stratford Canal) to investigate the need for aqueducts on canals and to design, make and evaluate an aqueduct.

LO 3. Explore how locks raise a boat from one level to another.

Use [Locks](#) to investigate the purpose of locks and how they work. Discover what is meant by a “flight” of locks and “staircase” locks.

Children can then use the [Build a Lock](#) game to build a virtual lock and to take part in a quiz to test their understanding of locks. They can then use the [Lock Challenge](#) game to see if they can operate the locks on their own!

As an extension activity, use [Diary Writing](#) to investigate the life of a lock-keeper on the Caledonian Canal. Children can then write a diary account of the life of a lock-keeper. Children may also visit [Canal Junction – Engineers](#), then [Canal Locks](#) to see photos of locks.

LO 4. Solve the problem of raising or lowering boats on a steep gradient.

Investigate previous solutions to the problem:

1. Inclined planes. Children can investigate the [Foxton inclined plane](#) on the Grand Union Canal. Use [Foxton Locks information pack](#). They can also visit the [Foxton Inclined Plane Trust](#) website.

2. Boat lifts. Children can visit the [Anderton Boat Lift](#) website. This includes pictures, a webcam and a sequence of photos taken on a passage through the boat lift.

Children can then design and make their own structures to raise and lower boats up and down a steep gradient.

As a plenary activity, children can evaluate each other's designs. Then use [The Falkirk Wheel information pack](#) to compare the children's solutions with the Falkirk Wheel, the world's first and only rotating boat lift. Further information and photographs can be accessed on the Falkirk Wheel website at [History and Design](#), [The Millennium Link](#) and [Engineering \(or 'How Does It Work?'\)](#).

Details of inclined planes and boat lifts in other countries can be found on the Internet e.g. [Big Shute Marine Railway](#), Canada; [Canal du Centre](#), Belgium.

Further information can be found at www.canals.com/lifts.htm