

Introduction

This series of six lessons involves children working in small groups to design, make and evaluate a bridge for a waterway. The first lesson involves a visit to a waterway and is optional.

Schemes of Work KS2: WOW Design and Technology Scheme of Work on canal bridges, aqueducts, locks and boat lifts.

Learning Objectives

To investigate bridges, thinking about how they work and how they are used.

The Curriculum

England – KS2: DT 5a

Scotland – Technology – Knowledge: Needs and how they are met, level C

Wales – KS2: Design and Technology 2.2

Resources

Bridge Building worksheet 1, pencils, clipboards.

Key Vocabulary

Material, span, estimate.

Teaching Activities

Health & Safety Prior to a waterway visit we recommend that you undertake an activity from the [Waterside Safety](#) resource.

Introduction Explain to the children that you are going to visit a waterway as an introduction to a D&T project on bridge building. Discuss with the children the importance of **SAFE (Stay Away From the Edge)**.

Activity At the waterway split the children into small groups. Make sure that each group is accompanied by an adult. You may want to keep the groups together or, if you are in an area with more than one bridge, you may want the groups to visit different bridges.

Distribute Bridge Building worksheet 1, read through it with the children, explaining any unfamiliar words and reminding them of how to make estimations.

Allow enough time for the children to complete the worksheet.

Plenary At the end of the lesson, discuss the children's answers. Ask the children to collect pictures of bridges from magazines, newspapers, books etc. for the next lesson.

Differentiation

This lesson has been designed for use with children in KS2. Older or more able children could visit [Canal Junction – engineers](#) and, using the photos there, evaluate the purpose and design of different bridges.

Cross-curricular

This lesson may be linked with work in ICT and Science.

Follow-up

Visit [Bridges](#) to see 4 different animated bridge types.

Introduction

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Schemes of Work KS2: WOW Design and Technology Scheme of Work on canal bridges, aqueducts, locks and boat lifts.

Learning Objectives

To investigate how different bridges work, using a variety of sources.

The Curriculum

England – KS2: DT 1a, 5a

Scotland – Technology – Knowledge and Understanding: Needs and how they are met, level C

Wales – KS2: Design and Technology 1.1

Resources

Pictures of bridges (brought from home), Bridge Building source sheets A, B and C.

Each group of children will also need 5 sheets of sugar paper (try to have a different colour for each group), 500g weights, rulers.

Key Vocabulary

Material, span, estimate.

Teaching Activities

Introduction Get the class to brainstorm all the uses of bridges that they can think of e.g. to carry roads, people, rails. What goes over/under each one? How would they differ? (Built to carry different loads, span different distances, made of different materials, etc.).

Class Activity Ask the children to show their pictures of bridges and discuss with them the differences in the design and purpose of the bridges.

Distribute Bridge Building source sheet A and get the children to comment on the different styles of waterway bridges. Why have so many different designs? (Bridges designed for different purposes – e.g. the arched steel bridge carries pedestrians.)

Group Activity Split the children into small groups and distribute the design brief (Bridge Building source sheets B & C). Explain the task and remind them of the importance of working together.

Show the children the paper they will be using and let them feel the 500g weight. Ask the groups to discuss any problems that they may foresee.

Plenary As a class discuss any issues raised and allow the children to present their problems and possible solutions.

Differentiation

If you have grouped the children by ability then you might wish to extend the task for the more able by adding more specifications; for the less able you can simplify them.

Cross-curricular

This lesson may be linked with work in Science.

Introduction

This series of six lessons involves children working in small groups to design, make and evaluate a bridge for a waterway.

Schemes of Work KS2: WOW Design and Technology Scheme of Work on canal bridges, aqueducts, locks and boat lifts.

Learning Objectives

To investigate different constructions of bridges. Design a model bridge according to specific design criteria.

The Curriculum

England – KS2: DT 1a, 1c, 1d, 2a, 2c

Scotland – Technology – Skills: Preparing for tasks, level C.

Wales – KS2: Design and Technology 2.2, 2.3, 2.4

Resources

Bridge Building source sheets A, B and C, Bridge Building worksheet 2. Each group of children will also need 5 sheets of sugar paper (try to have a different colour for each group), 500g weights, rulers, pencils, sticky tape. Optional: access to Internet.

Key Vocabulary

Load, span, structure, construction, design specification, criteria, mass, cylinder, arches.

Teaching Activities

Introduction Read back through the design brief (Bridge Building source sheets B & C) with the children.

Group Activities Look again at source sheet A and the pictures of bridges brought in by the children, this time looking at the different construction methods used.

If there is Internet access allow the children to use a search engine to run a search on 'bridge design' or use the useful links page on the WOW website to find bridge design sites.

Alternatively, get the children to experiment with a sheet of sugar paper by making different shapes for construction. You may wish the children to complete Bridge Building worksheet 2.

At the end of the lesson the children should be able to draw and label their plan of the design on to worksheet 2.

Plenary Allow the children to present their plans to the class. Has the practical experience helped them to discover which bridge building techniques might yield the best results?

Differentiation

Older or more able children may be working on the task with more specifications and the younger or less able children could have fewer specifications to work towards.

Cross-curricular

This lesson may be linked with work in ICT and Science.

Teacher sheet – Lesson plan

Bridge Building 4 & 5



Introduction

This series of six lessons involves children working in small groups to design, make and evaluate a bridge for a waterway.

Schemes of Work KS2: WOW Design and Technology Scheme of Work on canal bridges, aqueducts, locks and boat lifts.

Learning Objectives

To build, test and redesign a bridge built to a design specification.

The Curriculum

England – KS2: DT 2a, 2b, 2d, 3a, 3b

Scotland – Skills in Technology: Carrying out tasks & Reviewing and reporting on tasks, level C.

Wales – KS2: Design and Technology 2.5, 3.1, 3.2, 3.3, 3.4, 3.5

Resources

Bridge Building worksheets 2 and 3.

Each group of children will also need 5 sheets of sugar paper (try to have a different colour for each group), a selection of weights up to 500g, rulers, pencils, sticky tape.

Key Vocabulary

Load, span, structure, construction, design specification, criteria, mass.

Teaching Activities

Introduction Remind the children of the design brief, the time they have for the task and the importance of team work. Give each group a different colour of sugar paper this will help you to keep track of who's doing what and who's left a mess on the floor!

Group Activities Allow the children to work in their groups to make their bridges. They will need to test their structures by adding weight to them and to check they are fulfilling the other parts of the design specification. They should constantly evaluate and change their design using Bridge Building worksheet 3 to record their progress.

At regular intervals get the class to stop work on their own bridges so that different groups can talk about any difficulties they've encountered and how they plan to resolve them. Can other children in the class suggest solutions?

Plenary Ensure that each group has managed to solve or has planned to solve any problems that they have encountered.

Differentiation

Make the task more challenging by altering the design specification. For example, you could limit the amount of paper used or increase the span of the bridge. Alternatively the task could be simplified by removing some of the criteria.

Cross-curricular

This lesson may be linked with work in Science.

Teacher sheet – Lesson plan

Bridge Building 6



Introduction

This series of six lessons involves children working in small groups to design, make and evaluate a bridge for a waterway.

Schemes of Work KS2: WOW Design and Technology Scheme of Work on canal bridges, aqueducts, locks and boat lifts.

Learning Objectives

To test and evaluate the bridge design according to specific criteria.

The Curriculum

England – KS2: DT 3c

Scotland – Technology – Skills: Reviewing and reporting on tasks, level C.

Wales – KS2: Design and Technology 3.6

Resources

Completed bridges, weights to 500g, rulers, an A3 copy of Bridge Building worksheet 4 or photocopied on to acetate for use on an overhead projector.

Key Vocabulary

Load, span, structure, construction, design specification, criteria, mass, evaluation.

Teaching Activities

Introduction Explain to the children that they will be testing and evaluating their bridges. Display worksheet 4 for all groups to see.

Class Activities As a class, evaluate the bridges a group at a time. Before you test the bridges ask the group if they feel they met the design specification. Complete the worksheet for each group.

Plenary Encourage the groups to explain the reasons why they chose their design and the difficulties they encountered and how they solved them. What would they do differently next time?

Differentiation

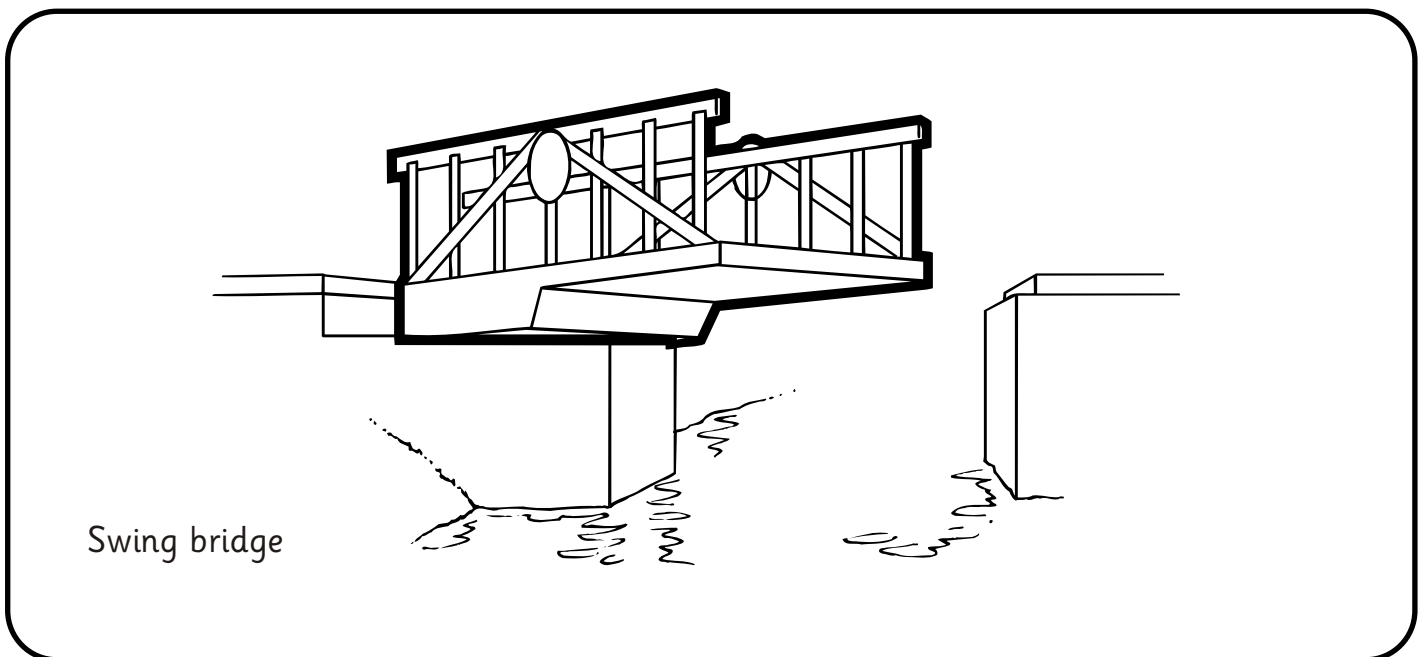
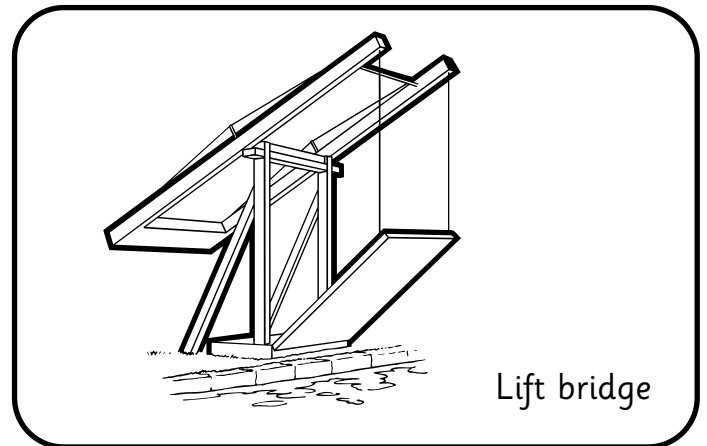
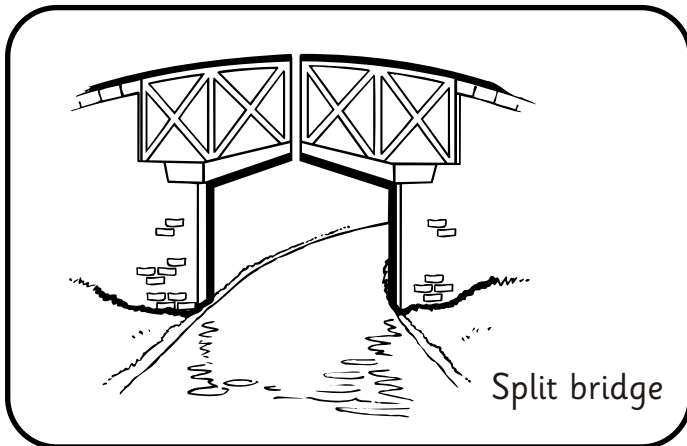
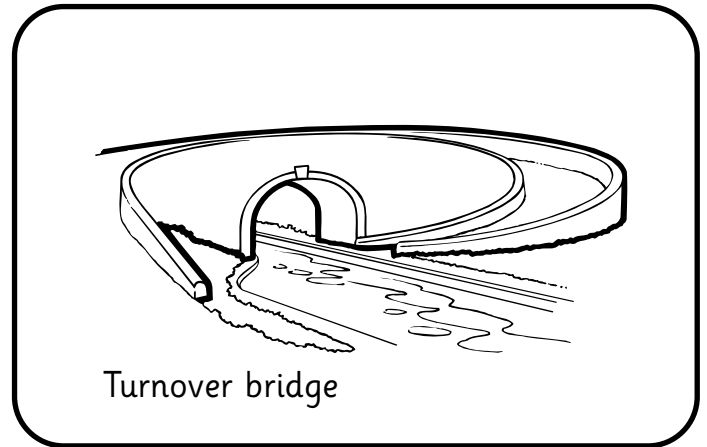
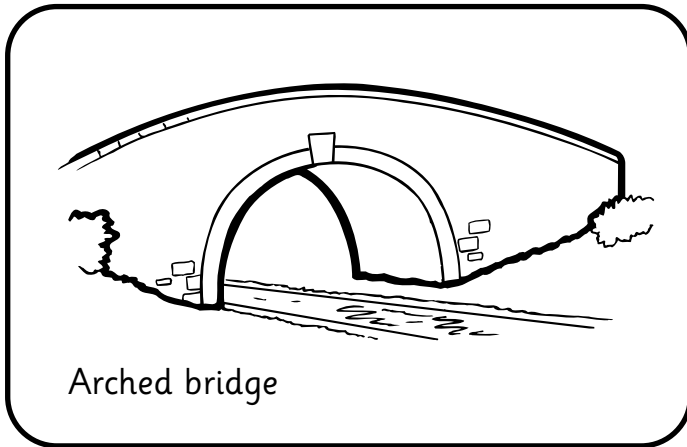
Younger or less able children may have built a model according to fewer specifications. If this is the case ensure that worksheet 4 reflects this for these groups.

Cross-curricular

This lesson may be linked with work in Science.

Follow-up

Visit [WOW DT Scheme of Work](http://www.wow4water.net) for further ideas.








Farmer Giles has a problem. He has bought a field on the other side of the waterway to his farm but the nearest bridge is 1 mile away. This means that he has to travel 2 miles to get to his field and another 2 miles back. Farmer Giles knows that his new field would be excellent for grazing sheep in, but at the moment it takes him so long to get to the field that it's not worth it. Farmer Giles would like to build a bridge over the waterway so that he could get to his field more easily.

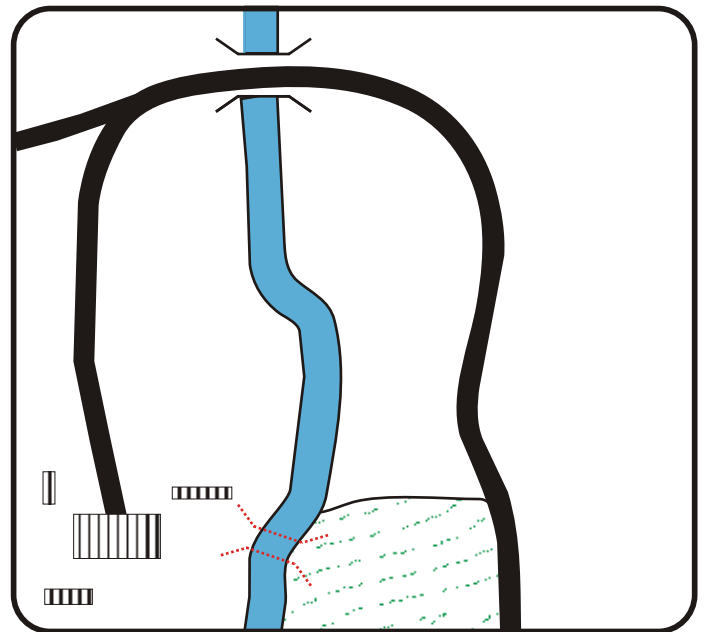
Not everyone wants the bridge to be built so the design of the bridge will be important in helping to persuade the council and British Waterways that it's a good idea.



Are you ready for a challenge?

Key:

 Road	 Waterway
 Field	 Existing bridge
 Farm	 New bridge



Design Specification

Farmer Giles needs a bridge design that:

- Will hold the mass of his flock of sheep (500g).
- Will span the width of the waterway (20 cm).
- Will be high enough to let craft pass underneath it (10 cm).
- Will look attractive.
- Will not be too expensive.

Time limit

Farmer Giles needs a model of the bridge in four weeks time, ready for the next council meeting. You have **four** sessions to **design and make** a model of the bridge.

1st session - look more closely at existing bridges, experiment with the materials and decide on a plan.

2nd session - build the bridge and start your notes.

3rd session - build the bridge and complete your notes.

4th session - present your bridge to the council. It will then be judged against the design specification and evaluated.

Materials

Your group will be given five large sheets of sugar paper. Use them carefully as you will be penalised if you need more paper! Although your model will be made mainly from paper, you may use some sticky tape, but you will be penalised if you use too much.

Council judging criteria

In the final session your bridge will be judged against the following criteria:

- Does the bridge hold 500g?
- Is it at least 20 cm wide?
- Is it high enough to let a craft pass under it (at least 10 cm)?
- Is the physical appearance of the bridge good?
- Have the materials been used wisely?

Good luck!

Name _____

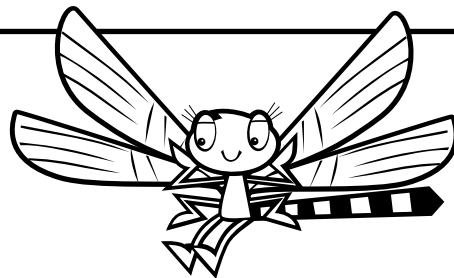
Date _____

Look at the bridge and answer the questions.

1. What travels over the bridge? _____
2. What travels under the bridge? _____
3. What materials are the bridge made from? _____
4. Estimate when the bridge was built. _____
5. Estimate the height of the bridge. _____
6. Estimate the span of the bridge. _____

Draw a sketch of the bridge in this box. Remember to label it!

Remember to
**Stay Away From
the Edge**



I have investigated how a bridge works.

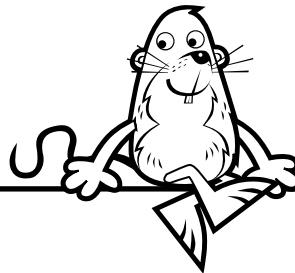
Name

Date

Experiment with the paper and complete the table below.

Type of structure	Unfolded, flat paper	Cylinder	Arches	Concertina	Your choice!
Mass added to collapse it					

Use what you have learnt from testing the paper to help you to design your bridge. Draw the design in the box below.



Remember to label the design and include the specifications!

I can develop design ideas.

Name

Date

Complete the chart below to record your progress.



Work as a team for the best results!

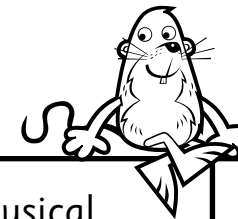
Lesson number	Work completed	Work to do	Difficulties encountered	Changes made to design

I can reflect on my design and improve it as I make the bridge.

Bridge Building

Name _____ Date _____

Complete this table together.



How successful were you?

Group	Holds 500g	Span of at least 20 cm	Height of at least 10 cm	Physical appearance of bridge	Use of materials