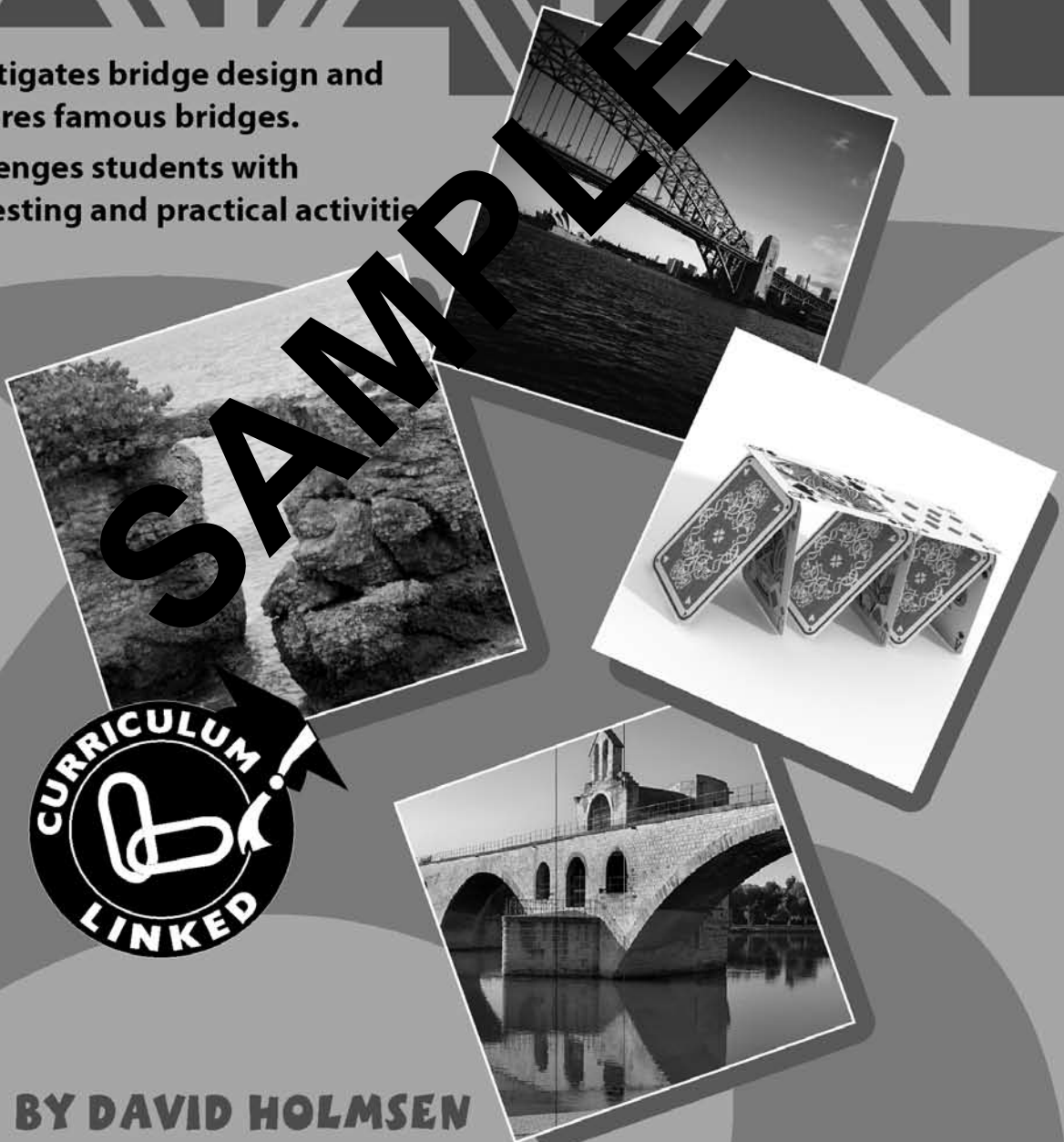


BRIDGES

- Investigates bridge design and explores famous bridges.
- Challenges students with interesting and practical activities



BY DAVID HOLMSEN

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Teachers' Notes

Bridges is written primarily for teachers of Design and Technology, but it can also be used in English and Information Technology lessons. It can be taught to Years 5, 6, 7 and 8, as the activities can be easily adapted to suit different age groups.

This book explores how engineers have, over time, planned, designed and constructed a range of bridges and learned from their mistakes and discoveries. It looks at the first and most recent bridges and examines the materials that have been tried and tested over the years. This book will help students appreciate why bridges stay up as well as understand why they sometimes tragically fall down.

Students are encouraged to test their own engineering skills by making their own bridges from a number of materials for a range of purposes.

They are also encouraged to explore how bridges have played a main role in popular culture because they are so often viewed as strong symbols and metaphors.

More bridge activities are provided at the back of the book and can be used for early finishers or to extend more able students.

Curriculum Links

- **WA (Technology and Enterprise)**
Materials (2)
Enterprise (5)
Technology Skills (6)
- **VIC (Design, Creativity and Technology)**
Investigating and Designing – Levels 4 & 5
Producing – Levels 4 & 5
- **ACT (Technology)**
ELA 25 – The student designs, makes and appraises using technology. 25.EA.1, 25.EA.5, 25.EA.8
- **TAS (Vocational and Applied Learning)**
Innovation and Design – Standards 3 & 4
- **NT (Design and Technology)**
Designing – Bands 3 & 4
- **NSW (Design and Technology)**
Knowledge and understanding of design concepts and processes (1)
Understanding and appreciation of the impact of past, current and emerging technologies on the individual, society and environment (2)
Knowledge and understanding of skills in managing resources and producing quality design solutions. (6)
- **SA (Design and Technology)**
Making – 3.5, 4.5
- **Q/LAND (Technology)**
Technology Practice – Levels 4 & 5

Tell Me About Bridges 1

Listen to the Bridges

The advancement of bridges has paralleled the advancement and spread of people around the globe. Bridges have helped millions of people every day go about their ordinary daily lives. Each bridge has a unique story to tell about the people whose lives are linked with its success or failure. Bridges tell the stories of the people who have designed, built and used them. They tell the stories of the people who have damaged and destroyed them. They tell the stories of the people who have then re-built, celebrated and strengthened them.

BIGGER, BETTER BRIDGES

Deep valleys and vast water expanses are becoming worthy challenges for engineers who are now capable of building longer and bigger bridges than ever before.

There may come a time when no distance or object will be enough to stop the building of a bridge.

Bridges stand as proof of humankind's incredible ingenuity.

RESEARCH →



Research bridges that have broken world records. Look up the longest bridge, the oldest bridge, the widest bridge, the highest bridge, the most expensive bridge, the busiest bridge and the longest main span bridge. Record your findings below.

The Longest Bridge:

The Oldest Bridge:

The Widest Bridge:

The Highest Bridge:

The Most Expensive Bridge:

The Busiest Bridge:

The Longest Main Span Bridge:

Claim to Fame ②

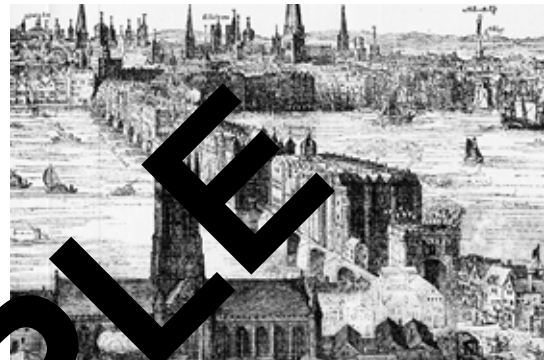


"Pons Sublicius" Wikimedia commons

It was the Romans though, who were the first to be recognised for their superior bridge building techniques and beautiful designs. The most famous of the Roman bridges is the Pons Sublicius. The Pons Sublicius was originally built from wood, before it was later rebuilt from stone. It was not

unusual for early bridges to be destroyed and then rebuilt, sometimes many times. Over the course of 2000 years, London Bridge, for example, was built and re-built several times after being washed away, destroyed by invading Norwegians and levelled by fire.

The Romans are most noted for their clever stone arch bridge designs, which they constructed all over their vast empire to help open up trade routes and move troops quickly. In 55 BC the Roman Emperor Julius Caesar built two famous bridges considered masterpieces of military engineering to help his 40,000 strong army cross the Rhine River. Historians claim that the strength of the Roman Empire during this time was largely due to the roads and the bridges that they constructed.



"London Bridge" Wikimedia commons

COMPREHENSION →

Reread the passage above and answer these questions.

1. Bridges often fell down in the early days of bridge building. Why? _____
2. How did bridges help the Romans in times of war? _____

YOUR TASK →

Think about Famous Bridges

Just about every city has bridges, but why do certain bridges become associated with cities, while other bridges go unnoticed?

What bridges do you associate with the following cities:

New York	_____	London	_____
San Francisco	_____	Bath (UK)	_____
Sydney	_____	Venice (Italy)	_____

Give one more example of a famous bridge and the city it is associated with:

The Four Bridge Designs ①

Every bridge is unique because no two bridges are built under exactly the same circumstances. They are all built in different places, in different times, using different materials, spanning different distances and they all serve different purposes.

Engineers have developed bridges that fall into one of four basic categories:

- **The beam bridge**
- **The arch bridge**
- **The suspension bridge**
- **The cable-stayed bridge**

Each of these bridge types can be described in more detail according to their type of span (e.g. continuous, cantilever, simple), the material that they are predominately made from (e.g. stone, concrete, steel) and where their road deck appears (e.g. deck, half-through, through). Sometimes bridges are a combination of bridge designs (hybrids) and cannot be identified as exclusively belonging to one particular category.

THE BEAM BRIDGE

The beam bridge (also known as a girder) is the oldest, cheapest and most common of the bridge designs.

It is also the most simple. A beam bridge is a horizontal platform placed over two end piers. The first beam bridges were just logs placed over streams. Early beam bridges were built from wood, but today they are typically made from reinforced concrete and steel that is needed to carry the weight of heavy trucks and trains.



THE ARCH BRIDGE

As its name suggests, an arch bridge is identified by its arch shape. Built over short distances, these types of bridges are constantly under compression and so are constructed from materials strong enough to withstand pressure.



THE SUSPENSION BRIDGE



Suspension bridges are strong and flexible and are designed to be built over long distances. They have their disadvantages though. Read on.

THE CABLE-STAYED BRIDGE

Cable-stayed bridges are recognisable by their unique A, Y or diamond shaped towers. The towers are always in compression. Cable-stayed bridges are cheaper and easier to build than suspension bridges.



The Four Bridge Designs ②

ANSWER THESE QUESTIONS→

1. In what order do you think the four bridges were invented? Explain your answer.

2. If you only had a tree trunk to use, which bridge design would you build?

3. Which bridge do you think is better suited to be built over longer distances? Explain why.

4. Describe what an arch bridge looks like.

5. Which bridge do you think is the most popular bridge in the world? Explain your answer.

6. What are some materials bridges can be made from?

EXTRA →

Act It Out

Use your body (no talking) to demonstrate the four different types of bridges – arch, beam, suspension and cable-stayed. Perform by yourself (or in a small group) in front of the class. You may use a limited number of props.

TEST YOUR SKILLS→



Website Challenge

Log onto this website:

► www.pbs.org/wgbh/nova/bridge/
and test your engineering skills.

Match the right bridge to the right location.