

## Teachers' notes

# Building the Sydney Harbour Bridge

By John Nicholson

Notes by Julie Miller

These notes may be reproduced free of charge for use and study within schools but they may not be reproduced (either in whole or in part) and offered for commercial sale.

The following is a list of activities which have been suggested by the text and which have been organised under the key learning areas of the New South Wales schools curriculum.

To launch this unit, it would be great to invite an older citizen of the community to talk about life in the 1920s and 1930s and what they remember of the early days of the bridge.

Alternatively, contact Film Australia (see website at the end of these notes) for a historical film called *Sydney Harbour Bridge* (7 mins)

Or course, where it is possible, a school excursion to Sydney and the Sydney Harbour Bridge would be great lead-in!

### **Studies of Human Society and the Environment**

- 1 Before the bridge was built in 1922, Sydney was divided into two cities-between the south and north side of the Harbour. (Page 3) List the main reasons you think that people wanted a bridge built, such as transport needs, work and housing opportunities. Were there any disadvantages to building the bridge for the environment, or community?
- 2 Invite a grandparent or older local person to come to school and talk about life in the 1920s and 1930s. Research one element such as transport, fashion, schooldays, and kinds of work, home life or pastimes.
- 3 Create a timeline of the most important dates in the building of the bridge, and include in it your own illustrations. Give an oral explanation of your timeline to the class.
- 4 Working conditions on the bridge (see page 22) were often hard and dangerous, and very different from conditions for workers today. Invite a speaker on occupational health and safety to discuss laws that have been introduced to protect workers.

- 5 John Nicholson says, "The Sydney Harbour Bridge remains Australia's most identifiable symbol" (page 31). What other structures or sites in Australia do you think are national symbols? You could consider other unique buildings or constructions, and sites of natural beauty, or of historical or spiritual significance. On a map of Australia, mark the location of your chosen sites. Choose one site to research as your individual project.
- 6 Collect some tourist brochures and photographs of different places in Australia. Prepare a talk for your class about places that you have been to, and places that you have read about or would like to visit.
- 7 What were the main forms of transport when the Sydney Harbour Bridge opened in 1932 (see page 30)? What did cars look like at the time? In 1932, 11 000 vehicles used the bridge. Research how many vehicles use the bridge today, including the ones that use the harbour tunnel under the bridge. What impact on the environment does this have? What changes to the use of the bridge do you think will happen in the future?
- 8 Look at the picture on page 3 of the book showing a map of Sydney Harbour. Imagine that the New South Wales government wants to build an additional bridge across the harbour. List the advantages and disadvantages of building another bridge, for both the community and the environment.

### **Science and Technology**

- 1 The Sydney Harbour Bridge as we know it was one of many designs submitted from bridge-builders around the world. Page 4, "Bridging the Gap", shows two other designs that were submitted in a 1900 competition. What kind of bridge would you have designed? Research some famous bridges around the world to give you ideas for your own design. On your drawing, list the materials that you would use for your bridge.
- 2 Pose the question: How is steel made? Research where steel comes from, what raw materials are needed, and the general properties of steel, such as how it expands and contracts with heat. How did the builders of the Sydney Harbour Bridge solve this problem? Also research different uses of steel in our everyday life.
- 3 Working with a friend, collect materials to build your own model bridge. Use a variety of materials such as construction toys (e.g. Lego), recyclable containers, string, glue and tape. Think about different bridges you have looked at for design ideas.
- 4 After constructing your bridge, write a short report on how it was made. Organise your writing under the headings "Materials needed" and "Steps to make the bridge". You

may also wish to include diagrams showing each of the steps in constructing your bridge.

### **English**

- 1 Design a tourist brochure, "Visiting the Harbour Bridge", to encourage people to take a walk to the top of the bridge. Include in your brochure relevant information about the bridge and illustrations.
- 2 Imagine you are a construction worker; write a diary entry titled "My first day working on the bridge". Look at the illustration on page 23 for inspiration for your story.
- 3 The opening of the bridge in 1932 was a huge event (a list of many of events is given on page 29). Plan a modern version of the opening. Who would be involved, and what kind of events would take place? Write a description of the day, under the headings "Land, sea and air events".
- 4 Newsflash! What front-page story did the newspapers have the day the bridge opened? Design your own story with a catchy title, sub-headings and illustrations.
- 5 Premier Jack Lang opened the bridge in 1932. Imagine that you had been chosen to open the bridge, what would you say in your speech? Who would you thank, and what thoughts would you have for the future? Plan a three-minute speech to present to the class.

### **Creative Arts**

- 1 During the 1930s the building of the bridge was a spectacular event, inspiring many artists to draw and paint the bridge under construction. Look at the picture "The Curve of the Bridge" 1928-29 by Grace Cossington-Smith. (You can source this painting from Australian art books or the Art Gallery of NSW website given at the end of these notes.)
  - What do you think the artist thought about the bridge?
  - What do the line patterns suggest? What colours, shapes and patterns do you see?
  - Does the painting look strong or soft?
  - Why do you think the artist used colours other than the real colours of the bridge?
  - What does the painting make you feel about the bridge?
- 2 Find a drawing or photo of one part of the bridge to help you create your own picture of the bridge. Look at the angular style and bright colours used by Grace Cossington-Smith. Make sure you have a strong contrast in colours between the bridge and the background.

## **Mathematics**

### **Measurement**

The heavy workshop was where workers cut large pieces of steel for building the bridge, and was 150 metres long and 46 metres wide (page 6). Next to it was the light workshop, where workers assembled smaller parts of the bridge. The light workshop was 180 metres long and 40 metres wide. How many square metres was the heavy workshop? How many square metres was the light workshop? What is the difference in area between the two workshops?

On the 13th August 1930 a violent windstorm hit Sydney, buffeting the incomplete arch (page 24). On 9 September 1930, the arch was finally completed. How many days were there between these two events? (Don't forget which months have 30 or 31 days.)

The bridge took seven years and 356 days to build. How many days in total did it take?

The steel arch of the bridge is designed using a particularly well-known shape (triangles). What properties do triangles have in building design (page 10)?

During bridge construction, workers had their hours cut from 44 to 33 hours a week, allowing more unemployed people to work during the depression. How many fewer hours a month did they then work?

The top of the Sydney Opera House is 70 metres above sea level, and is 10 metres higher than the roadway on the bridge. How many metres above sea level is the Harbour Bridge roadway?

### **Number**

In 1932 the costs of travelling over the bridge were very different from costs today (see page 31). What would have been the total cost for a motorcar, a buggy and a horse to cross the bridge in 1930? Find out today's costs for a car, a truck and a motorbike.

Approximately six million rivets were used to build the bridge. Write six million in digits.

Forty thousand blocks of stone were used for the building of the pylons and abutments. Write this number in words.

The total length of the bridge is 1149 metres, with the length

of the arch being 503 metres. How many metres longer is the bridge than the arch?

Before the bridge was built, 600 000 people lived on the south side of the harbour, with only 50 per cent of this number living on the north side. How many people lived on the north side at this time?

### **Graphs**

Sixteen workers were killed during the building of the bridge (page 22). This was far fewer than the 56 workers killed on the Forth Bridge in England and the 139 workers who lost their lives on the Brooklyn Bridge in the USA in the 1880s. (One hundred and twenty-one people were killed during the construction of the Snowy Mountains Scheme.)

To show the difference in the number of workers killed, make a vertical line graph.

Your graph should give the names of the different bridges along the horizontal line and the number of deaths along the vertical line.

Don't forget to give your graph a title.

### **Websites**

The following websites may be useful for both teachers and students. However, this list is in no way exhaustive.

- Film Australia  
<http://www.filmaust.com.au>  
*A unique collection of titles spanning 80 years of Australia's history*
- The Art Gallery of NSW  
<http://www.artgallery.nsw.gov.au>  
Under "Australian collections", you will find "The Curve of the Bridge" 1928-29 by Grace Cossington-Smith.
- Bridgeclimb – The Sydney Harbour Bridge  
<http://www.bridgeclimb.com>
- How stuff works: beam, arch and suspension bridges  
<http://www.howstuffworks.com/bridge>  
*Gives clear explanations about various types of bridges*
- Golden Gate Bridge  
<http://www.goldengate.org>  
*Official site of one of the world's greatest bridges, the Golden Gate bridge in San Francisco*

- Bridge science

<http://www.branta.connectfree.co.uk/bridges.htm>

*Lots of illustrations and information on types of bridges and how they work*

- Great Buildings online

<http://www.greatbuildings.com/types/bridge.html>

*Provides images and information about famous bridges around the world*