

# EA **jnr** club

Lower Primary

## TEACHER RESOURCE KIT

### Construct a straw bridge

This guide includes:

- Lesson ideas
- Project instructions
- 'Simple machines every day' activity sheet
- Know Want Learnt (KWL) Chart
- Think Want Learnt How (TWLH) Chart



# Construct a straw bridge: *lesson ideas*

## Science

- Students to think of, and write down, as many materials used in the construction of bridges as they can (showing students pictures of bridges may help with this activity). What are the main types of materials used (e.g. steel, brick, wood, stone etc.)? Why do students think these materials are chosen?

## Technologies

- Use pictures and key words to create a display in the classroom based on engineering, building and construction.
- Show students pictures of bridges from around the world. Brainstorm and record why humans need bridges. Discuss various types of bridges (e.g. *beam, arch and suspension*).
- In teams, students to use Lego, or something similar, to construct a bridge. Perhaps provide rewards for the strongest bridge, the tallest bridge, the longest bridge etc. Students to design, make and appraise their own bridges. What worked? What didn't? Why?
- Students to go for a walk around the school looking for different types of simple machines. Students to complete the '**Simple Machines Every Day**' activity sheet.

## Mathematics

- Allow students free time to construct shapes using matchsticks, with Plasticine for joins. In teams, students to combine these shapes to construct their own bridge. Students to estimate how long their bridge will stand once it is weighed down with objects from the classroom.
- Students to brainstorm as many 2D and 3D shapes as they can. Ask students to identify which shapes are used in one or two famous bridges. Discuss why these shapes may have been used.

## English

- Students to brainstorm as many engineering words as possible and then create a page in their Science books on which to record them. Students will add to this as they learn new words. These words could be used to create a class word wall.
- Provide students with information on a variety of famous engineering structures. They then choose one and write a short information report on it.
- Students to listen to or view the 'Three Billy Goats Gruff'. Students could act out the story in small groups, constructing the type of bridge as a prop.
- Students to complete the '**KWL Chart**' or '**TWLH Chart**' activity sheet.



## Humanities and Social Sciences

### History

- The invention of tools and simple machines had an enormous impact on the way humans lived, survived and developed. As a class, discuss why we need machines and tools and how we use them in everyday life.

### Geography

- Students to research famous bridges from around the world and choose their favourite.
- Students to investigate what types of building materials are used to build bridges around the world. Why do you think different materials are used in different locations?
- Organise an excursion to visit significant buildings and bridges in your local area. Ask students to record what they see.

## The Arts

- Students to use the 'crayon-resist' method to create artwork based on bridges. Students to use pastelsto draw their design onto paper, completely covering it. They crumple up the paper tightly, then flatten it out, paint it with a wash of Edicol dye and allow it to dry.
- Students to make a diorama or model of a scene depicting an engineering wonder, such as the SydneyHarbour Bridge.
- Students to cut outlines of bridges, towers and buildings out of cardboard, sponge, or even potato, to make prints on paper using paint.
- Students to cut out pictures from magazines of bridges. Paste onto a large piece of paper to create a class collage on the topic.
- Show students, step-by-step, how to draw a famous bridge. Students draw the structure and later paint it.

## Health and Physical Education

- Students to use their bodies to create shapes and famous structures. The teacher calls out 'Harbour Bridge' and students use their bodies to form that shape.
- Create an obstacle course (*which includes ramps*) for students to complete.

## Languages

- Students to learn how to say and write words such as 'bridge', 'straw' and 'steel' in various languages.
- Students to investigate where the word 'engineer' comes from.



# Construct a straw bridge: *Project instructions*

## Important safety information

Allow plenty of time to discuss the safety precautions that are essential when assembling and testing straw bridges. As a class, discuss how students can keep themselves and others safe. These ideas should be presented on a class poster and displayed in the classroom. All students should agree with these rules before starting and the safety precautions and guidelines should always be observed.

## Getting started - research activities

- Provide pictures and discuss as a class some of the different designs and shapes of bridges. These could include various truss, arch, cantilever, post, suspension and cable-stayed designs. A Google search on 'bridge designs' will produce a number of sites with information on this topic. There are many famous world bridges of various designs, such as the Sydney Harbour Bridge, the Golden Gate, the Firth of Forth Bridge, Tower Bridge and so on. These could provide inspiration and direction for the students' designs.
- Students to participate in the 'Construct a straw bridge' lessons and complete the associated activity sheets.

## The design stage

Having explored various bridge designs (in the 'Getting started' activities), the teams can select their bridge type. The bridge is to span a distance of 40cm, with no supporting pillars to the ground in between the ends of the span, and be approximately 10cm wide. It needs to be strong enough to support a suitable load such as a book, a can of food, or other object of suitable weight placed on the middle of the completed structure. The load should be selected so that all the reasonably well-designed structures will pass the test.

## The construction stage

Having made plans, the next stage is for the students to construct their bridge.

Each team will need to construct the gorge over which to build the bridge. This could be two stacks of books of even height (or two blocks or bricks) spaced 40cm apart.

Students will also need the following construction materials:

- Plastic drinking straws (perhaps 50), each approx. 240mm long.
- Blu-Tack or thin strips of masking tape to hold the straws together.
- A strip of thin cardboard or paper approx. 45cm long and 10cm wide to act as the bridge decking (the pavement on the bridge). This should not form part of the structural strength of the bridge.
- Scissors to cut the straws to appropriate lengths.



## Testing the straw bridges

The completed structures can now be tested to see whether they will support the required load. Students could test the amount of time the bridge supports the load.

## Critiquing the designs

It is likely that the students will see a need to modify their designs in order to make improvements (either during the construction stage, when the design is tested, or both). They should be given opportunities to analyse their work, to come up with suggested improvements, and to test these.

## Assessing the projects

After completing the construction and testing of their bridges, students should be engaged in assessing the successes of their projects, which aspects worked well, what they learned whilst doing the project, what else they would like to learn, and which aspects they would do differently.

Some of the aspects to explore might include:

- Which particular designs were most successful? Why?
- Which shapes included in the designs appeared to be strongest?
- Are there any factors that seemed to weaken the structural units (the straws), or to create weak points in the structure. What were they?





# Simple machines every day

Name: \_\_\_\_\_

You see simple machines every day! But where?

**Draw three simple machines you have seen around your school.**

Name of machine: \_\_\_\_\_

Name of machine: \_\_\_\_\_

Name of machine: \_\_\_\_\_





# Know Want Learnt (KWL) Chart

Name: \_\_\_\_\_

What I <b>KNOW</b> about bridges	What I <b>WANT</b> to know about bridges	What I have <b>LEARNT</b> about bridges



# Think Want Learnt How (TWLH) Chart

Name: \_\_\_\_\_

What we <b>THINK</b> we know about bridges	What we <b>WANT</b> to know about bridges	What we have <b>LEARNT</b> about bridges	<b>HOW</b> we learnt it