# Robogals Science Challenge



Minor Challenge Set #3 STEM Field: Civil Engineering Level: Junior Challenge Name: Build The Strongest Paper Bridge Project Cost: 0-20 USD Materials Required: • 2x thick books or small boxes • 1x A4 paper

- Tape
- Small, heavy objects to use as weights, for example, coins, marbles

#### **Duration:**

• The challenge takes approximately 30 minutes to finish, however, the time guideline is an estimation only, and students and mentors can complete the tasks around their schedules.

## Introduction:

You probably have seen bridges around where you live. You may have noticed how they can be of different shapes or made of different materials. Some common bridge designs are shown below.

Beam bridge	Truss bridge
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If you have a ruler, try bending the ruler along the shorter side and the longer side. Is it easier to bend the ruler along the shorter, or longer side? You may notice the shape can affect the strength of the ruler. In this project we will build a simple bridge using a single sheet of A4 paper. Our aim is to build a bridge that can hold the most weight.

### Instructions:

- 1. Place your books or boxes about 25cm, or 10 inches apart.
- 2. Lay the A4 paper across the books.
- 3. Place a coin (or other objects as weights) in the middle of the paper. Observe what happens does the bridge collapse?
- 4. Fold the paper in half along the longer side, then place the paper across the books and place a coin (or weights) in the middle. Does the bridge collapse, or can it hold more coins (or weights)?

5. Experiment with different shapes for your bridge. Which shape makes the strongest paper bridge?

For example, change the number of times you folder the paper in half, or the shape you fold it in. Does a triangle-shaped bridge hold more coins (or weights) than a bridge with edges along the longer side? What about a tube-shaped bridge?



Remember to keep the distance between the books or boxes the same, as well as the coins (or weights) used.

#### Extension

Try building bridges from other household materials, such as aluminium foil, thin cardboard paper. Which material makes the strongest bridge?

### **Reflection Questions:**

- Are there any improvements you would make to this challenge?
- How much weight (e.g. how many coins) could the flat A4 paper bridge hold? Record the shapes of the bridges you built and how much weight it can support.
- From your experiment, what makes a strong paper bridge? Was it the shape, or number of folds, or other factors?



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• What factors do you think are important to keep consistent when designing a fair test to compare the strength of the different bridges you build?

### **Submission Guidelines:**

• Submit a photo of the experiment setup. Include a short summary that addresses the reflection questions.

Note: Remember, if you want to upload pictures of your Minor Challenge that also include you, please check if it is OK with your parent or guardian first.

• The submission form is on the Minor Challenges page: <u>https://sciencechallenge.org.au/index.php/minor-challenges/</u> Fill out the details and make sure you upload your submission.

### Learn More! Resources:

 If you want to learn more about what civil engineers do, you can read this article -<u>https://careerdiscovery.sciencebuddies.org/science-engineering-c</u> <u>areers/engineering/civil-engineers</u>

# **Bibliography:**

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