Minds in Motion

# Bridge-tastic Engineers

## What's The Plan?

Engineers use the steps of the Engineering Design Process to help them find the best possible solutions to their challenge. You'll use these steps to become a *Civil Engineer*, building a bridge and connecting a city!

## What You'll Need:

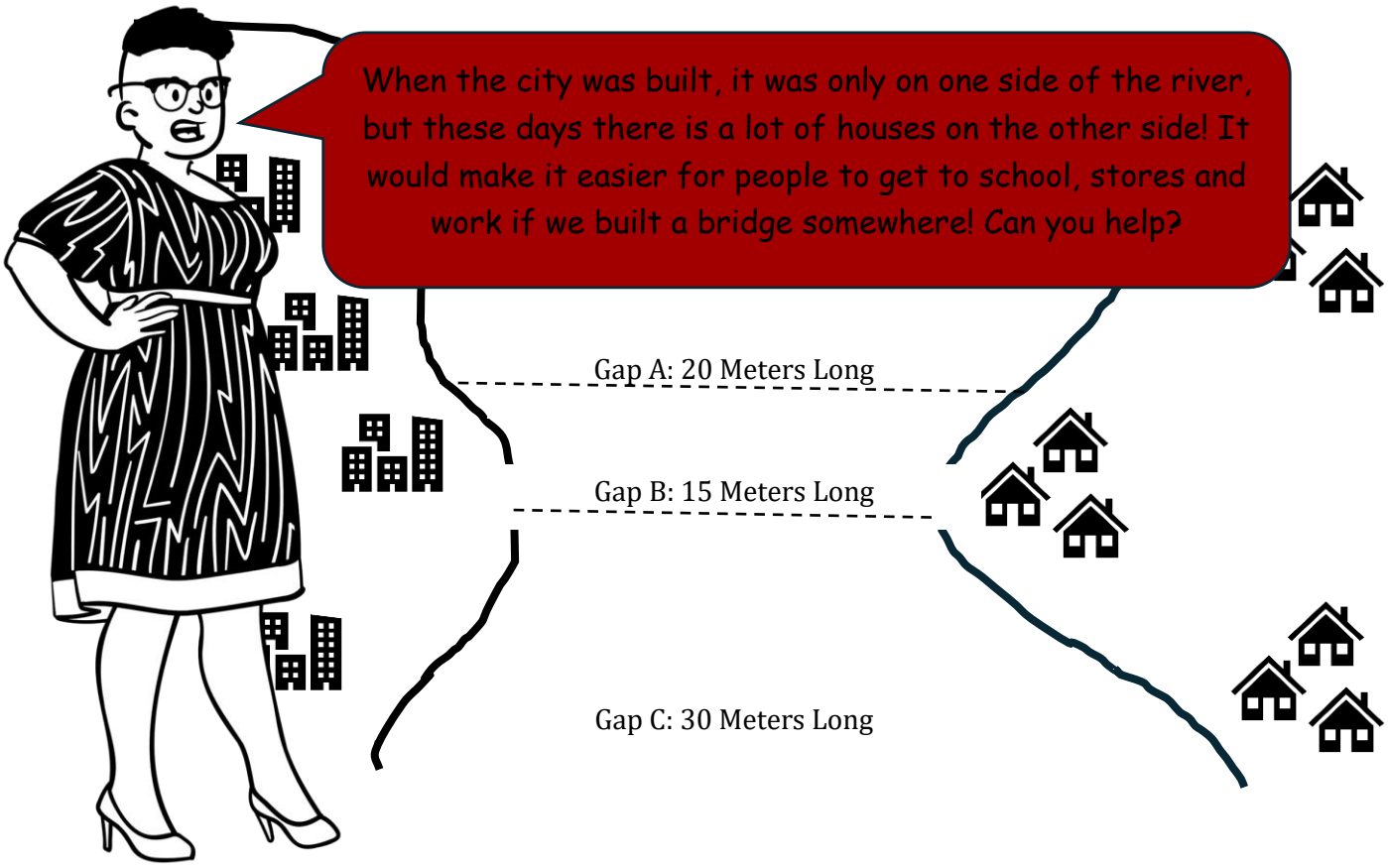
Here's a list of everything you'll need! Don't have something exactly? Get creative! Some of our suggested swaps are listed in Grey.

- 20 Popsicle Sticks | Stir Sticks, Skewers, Sticks
- 1 Foot of String | Twine, Ribbon, A shoelace
- Roll of Tape | Glue stick, White glue, Hot Glue
- Weights | Books, Toys, Rocks
- Two chairs to create a gap between | Tables, Books, Pillows
- A Ruler | Tape Measure, Meter Stick

# What To Do:

1. **Ask: What is the challenge you're trying to solve?**

   Look at the situation below, which gap do you want to try and build a bridge across? Who will be using your bridge and why?




2. **Imagine: Time to brainstorm!**

   How can you attach the popsicle sticks together to cross the gap? Think of as many ideas as you can, then start imagining how they might look in real life!

   We can *Scale* the gap down to make it easier to imagine and *Prototype*. We'll think of each meter in the problem gap as one centimeter in our prototype solution. This is a scale of 0.1%!

3. **Plan: Draw, Describe or Describe your idea.**

   What type of bridge will you build? *A Beam Bridge? A Truss Bridge? A Suspension Bridge?* Maybe you'll use some *Strong Shapes* to make your bridge extra sturdy?

4. **Create: Put your plan into action and get building!**

   We recommend taping or gluing popsicle sticks in a square, then adding a *Truss* across diagonally across it to make it stronger. Create enough of these squares to cover the entire length of the gap you chose (scaled down!) and add a few final popsicle sticks or pieces of tape to connect them in a long line!

5. **Experiment: Time to put your prototype to the test!**

   Start stacking different weights on your bridge and see how much it can hold! You can either add weights until your bridge breaks or watch for your bridge to start bending and end the experiment there! Don't be afraid to break your bridge though, it's just a prototype!

6. **Improve: How did your prototype do?**

   Was there anything you think you could improve on? Spend some time figuring out what went wrong and how you can make it stronger. You may need to test, redesign, then test again and again to find a solution you're happy with!

7. **Tidy up: This isn't part of the Engineering Design Process, but it's good practice!**

   Don't forget to clean up your workstation so it's ready for you next time!

# What Are We Talking About?

***Here is a list of important words we use during the project!***

- *Civil Engineer:* These engineers are responsible for creating the structures like roads, bridges, dams and more!
- *Scale:* Scale means the size of something! When we scale something down, we divide each measurement by the same number. For example, if our real life gap is 15 meters (1500 centimeters) we divide that by 1000, we get our scaled prototype size of 15 centimeters!
- *Prototype:* A prototype is the first model of a new creation, these aren't usually perfect, but can be used to test something before you create it for real!
- *Beam Bridge:* A beam bridge is made up of one or more long beams that are supported by pillars on either side! These bridges need to be very strong to hold their own weight and the weight of things crossing them, so they are mostly used for smaller gaps.

- *Truss Bridge:* A truss bridge starts like a beam bridge - long strong beams supported by pillars. The difference is that truss bridges have even more beams to help support the bridge. These are usually built into triangle shapes and go along the whole bridge.

- *Suspension Bridge:* A suspension bridge is held up by long and strong cables that attach to the road. These bridges are the best at flexing and moving with the wind, which means they work great for very long gaps!

- *Strong Shapes:* Some shapes are naturally stronger than others. A triangle for example, is strong because its equal sides can support each other, and it doesn't change shape easily. Some shapes, like squares or rectangles, can be made stronger by adding a *Truss*.
- *Truss:* We use a truss to turn a square into two triangles! This helps strengthen the square, and your structure over all!

## How Did It Go?

We'd love to hear about all the amazing STEM projects you're doing! Show us your finished projects on any of the following social media platforms by tagging us!

Twitter: @MyMindsInMotion
Facebook: @mindsinmotion2014 || @ucactiveliving
Instagram: @ucalgaryactive

SCAN ME

Let us know how you felt about the project! Please click here or scan the QR code above to fill out a short survey!