Bridge STEM Activity for E Week

INTRODUCTION

There are several types of bridges, each with their own advantages and disadvantages. In this activity, groups will assemble a model truss bridge.

Ask questions to get participants thinking about water:

- Why do we build bridges?
- What do we need to think of before building a bridge?
- How are large bridges different from small bridges?
- What makes bridges strong?

ENGINEERING CONNECTIONS

There are so many decisions to make about a bridge's design. Structural engineers must carefully consider the specific needs of each bridge project and must also understand the forces at work on bridges. When they draw up detailed plans for a bridge's design – including measurements, shapes, and materials – they consider the advantages and disadvantages of the different types of bridges. Cable-stayed bridges like the one in this activity involve cables attached to one or more towers that are separated by medium to large distances. These bridges are often used to cross waterways or valleys.

SCIENCE CONNECTIONS

Bridges are affected by several types of forces, but two in particular are tension ("pulling") and compression ("pushing"). By balancing between the pull of one and the push of the other, bridges can withstand heavy usage year after year. A truss bridge is a variation of a beam structure with enhanced reinforcements. The deck is in tension. The trusses handle both tension and comprehension, with the diagonal ones in tension and the vertical ones in compression. The structure is always pushing in on itself.

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Bridge Wars: Design Challenge

Split class into two groups so each can make a small-scale model of a bridge that is put together like a real one, using either toothpicks with bridge segments connected by gum drops or popsicle sticks connected by hot glue.

MATERIALS:

- Gumdrops or mini marshmallows
- Toothpicks
- Sheets of cardstock or heavy paper
- Pencils
- Notebooks

INSTRUCTIONS:

Time limit: 1 hour

1. Split the class into two groups, each with their own set of materials.
2. Each group will design a bridge using a style of bridge you think would be best to span over a distance. Draw a picture of your bridge.
3. Set up your bridge support structures—such as two desks spaced apart or two stacks of books spaced apart. (Start with the space between each structure measuring about 4 inches.)
4. Each group will insert the toothpicks into the gumdrops to create a bridge structure to match your picture.
5. Test the bridge structure by placing it on the supports spanning across the gap between them. Test the bridge by placing sheets of paper on it to see how well the bridge will stand up to the weight. See what increasing the space between the structures has on the strength of the bridge.
6. If there is time left, go back to the drawing board to improve your bridge, as needed.

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SOURCES:

Day 4 - Build a Bridge STEM Activity.pdf

https://www.youtube.com/watch?v=COFJWcEOcOE

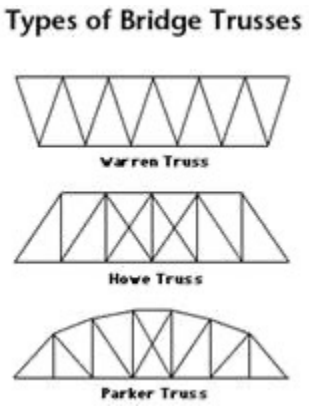
OBSERVE

What bridge design can span the farthest gap? Does increasing the number of materials have any effect on the strength of the bridge? What other materials can be used to make a stronger or weaker bridge?

LEARN

Construction of bridges often involve using the same set of materials such as concrete and steel, however each bridge design and the supporting structure vary depending on the span of the bridge and what weight the bridge will be subjected to. Engineers use those factors to design a bridge that both meet the aesthetic (the look of the bridge) and structure (the weight the bridge supports) needs.

EXAMPLE BRIDGE DESIGNS:



Source: Arch (nkfust.edu.tw)