Bridge Building

FRAMEWORK

I. Scientific and Engineering Practices • 2. Developing and using models
II. Cross-Cutting Concepts • 6. Structure and Function
III. Disciplinary Core Ideas • ETS 1: Engineering design

SKILLS/OBJECTIVES

- o Explore the strength of different geometric shapes
- o Learn that the triangle is the largest shape
- o Use this knowledge to create a strong bridge structure

MATERIALS

- Toothpicks
- Gum drops
- Mike and Ike candy
- Cardboard bridge templates
- Pictures of truss bridges
- Pencil
- Plastic cup with strings attached
- Weights

NOTES

- It may be helpful to prepare the before beginning. The strength of the shapes can be introduced in the introduction (before the activity) or during the activity.
- Assemble the cup with strings tied to it at the beginning so that it can be hung from the bridge at the end of the activity

Activity #1	**Bridge Building**
Materials	- Toothpicks - Gum drops - Mike and Ike candy - Cardboard bridge templates - Pictures of truss bridges - Pencil - Plastic cup with strings attached - Weights
Worksheet	Yes, pictures of the bridges

- In this activity we will build and test the strength of truss bridges. Truss bridges are built of only straight beams (ie, do not contain arches). Truss bridges almost always contain triangles because the **triangle is the strongest geometric shape**.

  1. Pass out one cardboard template, 30 toothpicks, 8 gumdrops and ~20 M&I candies to each kid to begin. They should use the gumdrops to connect the toothpicks for the base of the bridge and the other candies to connect the rest of the 'beams'. Allow them more supplies as necessary.
  2. Tell the kids their goal is to build the strongest bridge that passes over the 'river' and only touches the cardboard within the squares on either side of the river. There should be about 4cm between the bottom of the bridge and the water so that boats can pass through.
  3. If WORKING WITH YOUNGERS ONLY: explain to them that triangles are stronger than squares. Do this by making a square out of toothpicks and

gummies and a triangle out of toothpicks and gummies and squishing them with your hands to show that the square is easier to break than the triangle. You should pass these example structures around to each of the kids.

4. After about 10 minutes, pick 2 bridges and test strength (by attaching cup/string device and adding pennies to it). Use these bridges as an example to explain to them that **triangles are stronger than squares (**take home message!)

5. Show them pictures of truss bridges and remind them that the triangle is the strongest shape.

6. When the bridges are complete test them in the manner of the second bridge example photo (above). The cup with the strings will be preassembled. Add weights one by one until the bridge begins to crack.

7. If time, allow them to expand on their bridges to make them better and bigger!

8. Allow the kids to take their bridges home (but you'll probably want to toss the towers, if made, so the kids don't eat too much candy).
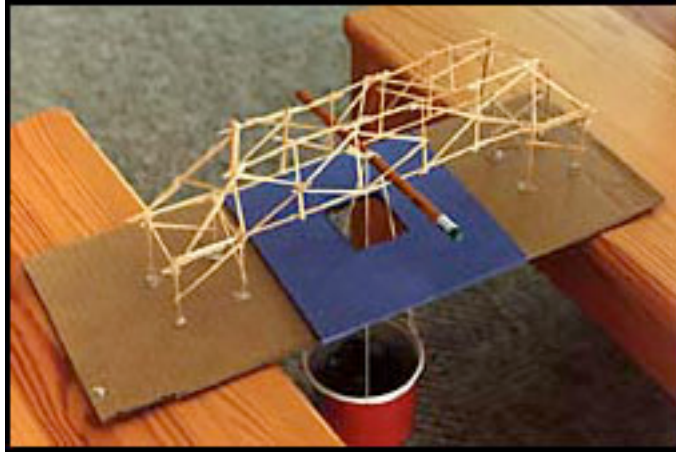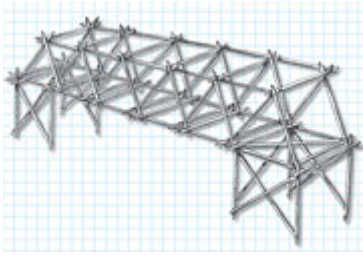
CONCLUSIONS
- Bring the kids back together and ask them:

- what bridges were the strongest? Why do you think they were so strong?

- What did we learn is the strongest shape?

Cardboard Template with central 'river':
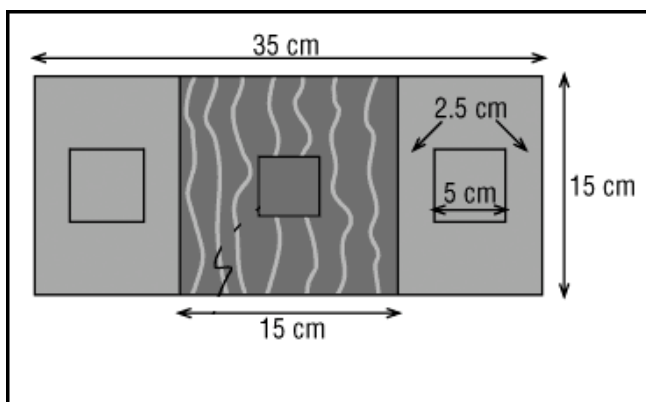
Bridge Examples:

These might be complicated than the bridges the kids will come up with, but are examples of the general idea.