

**Think
like an
Engineer**

Second Grade

Bridge Build



Objectives

Identify visual-spatial and problem-solving strengths

Materials

toothpicks	bridge pictures
gumdrops	flexible shapes
paper & pencil	cars
ruler	bridge supports
cardboard	
sheet with grid and instructions	

Time

40 to 45 minutes

Whole Group Gathered (10 minutes)

Introduce the first 5 vocabulary words, using included craft stick shapes to illustrate the concepts. Show the various polygons, and explain that structural engineers use these to build things, from space stations to cars. Demonstrate compression and racking, and then ask the students how to prevent racking in the square, pentagon and hexagon. (Cross-braces break down the inside of a polygon into triangles, which is the strongest polygon, since it resists compression and racking.) Show the use of cross-braces.

Show pictures of bridges with visible structural detail – Sydney Harbor, Duluth Lift Bridge, etc. Ask the group to identify the shapes that make up the bridge. Now, talk about the bridge truss (triangular supports on the bridge.) The truss spreads out the tension and compression of a bridge. Next, explain the materials they will be using, and invite them to create bridges that will span the supports and allow a car to drive across. The goal is to make the bridge sturdy enough to span an 8” gap and hold a car.

Pairs (20 minutes)

Give each pair a set of 48 toothpicks, 24 gumdrops, 1.5” x 10” piece of cardboard (decking), piece of paper, pencil and a ruler. Circulate during building time, asking open ended questions about the design. Reminders about the goal are allowed, but remember not to give design tips. Engineers can be encouraged to tweak or change a design, but do not give pointers.

Circulate-- test each bridge by setting it on the supports, set 8” apart, and scooting the toy car along the decking of the bridge.

Closure (5 minutes)

Look at the bridges. Which were the most successful, and why? What are some ideas for future attempts? Explain that building design includes many such attempts, including drawing, building scale models and then prototypes, testing, and starting over using what you’ve learned. Great start, Engineers!

Vocabulary~

Structural Engineering ~ a branch of civil engineering dealing primarily with the design and construction of structures (such as bridges and buildings.)

Polygon ~ n. a shape that has 3 or more sides

Compression ~ n. pressing together, forcing into less space

Racking ~ n. The distortion of a rectangular shape to a skewed parallelogram

Cross-brace ~ n. crosspiece that transmits, diverts, or resists weight or pressure

Truss ~ n. frame made out of triangles that supports a bridge

Decking ~ n. driving or walking surface of the bridge

Supports ~n. what a bridge sits on – also called a bent, which is made with piles (posts) and caps (braces that sit on top of the piles to distribute weight)

Blueprint ~ n. a detailed plan of how to build something

Bridge Support

Instructions

Put on your hard hats—it's time to do some engineering!

Your job is to build a bridge that will span the two supports drawn on this page. To test your bridge, set one DOTS box in each rectangle and set your bridge on top. If your bridge isn't long enough, or sags down, think about how you might fix it.

When your bridge is ready, place the bridge deck on your bridge and see if you can drive a car from one side to the other.

Keep working and thinking together until you run out of time.

Tip #1 – While you build, check to make sure your bridge is long enough to *span the supports*

Tip #2 – While you build, check to make sure your bridge is wide enough to *fit the car*

Bridge Support