

The Design Process 1.1 - Building Bridges

"We build too many walls,
and not enough
bridges."
-Sir Isaac Newton



Materials Needed:

GROUP SUPPLIES:

- 3/32" x 3/32" Balsa Wood Rods (lengths may vary)
- 3/32" x 2" x 16" Balsa Wood Plank
- Hot glue, Elmer's glue, super glue or other fast drying adhesive

CLASS SUPPLIES (one set necessary):

- Miniature toy car (Hot Wheels or the like)
- Variety of Books, with different weights
- Scale

*** ALTERNATIVE GROUP SUPPLIES***

Instead of Balsa Wood and Glue, try Pipe Cleaners, Masking Tape,
and Cardboard

Bridges are key to our infrastructure. In this exercise, your students will design their own bridges, and learn about the design process at the same time.

The Design Process is a thought and action process your students probably don't realize they use every day. Through deeper understanding of this concept, they can further implement this industry standard process in future projects and decision making. For more handouts, decision matrices, web diagrams and other useful charts, check our website at wrmake-it.org regularly, as we add new content periodically.

This module is a Design Challenge project. Design Challenge Projects involve a Student Challenge Card, which is located on the same webpage as this Instructor's Sheet.

Divide your class into groups of roughly 3 or 4 students. Each group will receive a Challenge Card, and a set of the group supplies listed to the left. We suggest bundling the materials to make distribution easy. Read the challenge out loud to the class, then have them work as a team to solve the problem.

"Bridges are key to our infrastructure. They cross highways, span bodies of water, and connect cities; all while bearing the load of thousands of cars each day. Today, your team will build a bridge out of the materials provided. The (balsa wood plank/cardboard) will be your roadbed, and your (balsa wood rods/pipe cleaners) will serve as the sides of your bridge. This car must be able to drive across your bridge smoothly, without falling off the sides or getting caught on the crossbeams. Your biggest challenge is to hold as much weight as possible, without the bridge collapsing. Think about famous bridges, and collaborate with your team to design your bridge. You have 35 minutes to collaborate, design and build. During testing, there will be no building or modifications allowed."

Allow your students to work on the design challenge, observing and helping as needed. At the end of the build time, have students bring their bridges to the front of the classroom to test. Have each team give a short description of their bridge, and their estimate of how much weight it will hold. Place bridges on the table to test each with the car, giving it one push to roll across the bridge. To test strength, let the students stack the books on their bridge, allowing them to choose which books to start with, and how fast to add load. When a team's bridge collapses, weigh in the books they managed to stack on top to get their final weight.

Follow up this project with the classroom discussion topics below, and build on this lesson with Design Process 1.2 - Design Process Posters.

Post-Project Classroom Discussion:

What steps did your team go through to come up with your design?

Try to use vocabulary such as Brainstorming, and Researching. Let them define their thought and action process in their own words, to build familiarity with the concept they are about to be introduced to.

How accurate was your estimated weight?

Have the students talk about what their expectations of the design were, and why. Steer them towards the next question, about how it could have been improved.

How could your bridge have improved if you had more time?

This question demonstrates the 'Evaluate Results' and 'ReDesign/Revise' steps of the design process. Have them compare their bridge to other teams' bridges based on success/failure of their designs.

Time:
40-55 minutes