

### Lesson 3 Newspaper Bridges I: Building with weak materials

**Objectives:** Students will experience building with a material that is inherently weak. They will experiment with ways to use the material to produce a strong structure.

Students will begin to develop an understanding of how structures are designed to bear loads.

#### Literature

**Tie-in:** Have students begin to read *Javier: Civil Engineering in the United States* from *Engineering is Elementary* (Museum of Science, Boston)

**Resource:** *Bridges: Amazing Structures to Design, Build, and Test* by Carol Johmann

**Materials:** For each student:

- ∞ Journal
- ∞ Pencil
- ∞ Optional: Photo from last project, glue stick to share

For each group of three to four students:

- ∞ 5 sheets of newspaper
- ∞ 2 chairs or desks 40 cm (about 15 inches) apart

For the entire class:

- ∞ Weights to test strength of bridge (small weights totaling at least 2kg)
- ∞ Meter stick

**Sponge:** Students glue picture from last project into journal, optional bridge worksheet from Museum of Science.

#### Initial

**Discussion:** Define problem for the day: Make a bridge across the gap between two chairs using only 5 sheets of newspaper. (Make up a story about why we need the bridge.)

Define constraints: Only 5 sheets of newspaper (ripping is OK, but once the paper is ripped, it's ripped). No tape, no scissors, no glue.

Students write problem definition and constraints in their journals.

Tell students that all measurements in this class will be metric. Ask students why it is important for scientists and engineers to know the metric system. (Metric is used world-wide; scientists and

engineers need to work with other scientists and engineers from throughout the world.)

**Project:** Students will build a bridge to span the two chairs or tables. If students have trouble making sturdy bridges with newspaper, have a successful group show the others how they have managed.



Gabby and Justin made a bridge that held more than 1500 grams!

**Vocabulary:** Constraint – restriction, limitation  
Gram – a metric unit of mass

**Final**

**Discussion:** Allow students to look at other groups' bridges. Have groups share their process. Ask the following questions:

- ∞ Which bridge looks strongest?
- ∞ Why do you think that one bridge is stronger than another?
- ∞ How did you make the bridge strong?
- ∞ What worked, what didn't work?
- ∞ How much weight does your bridge hold? (Take picture of bridge before testing weight.)
- ∞ What materials would you like to have to make a stronger bridge from newspaper?

Students draw pictures of their bridges in their journals and note the amount of weight their bridges held before breaking.