Human Suspension Bridge

Grade Level

Grades 4 through 6

Materials

Two pieces of sturdy, wide rope, each 10-12 feet long

Photographs of various suspension bridges, if available

Discussion

Engineers keep our world in motion, particularly on roads and highways.

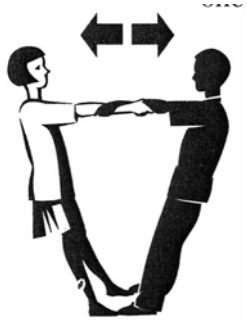
Engineers may be most noted for designing and building bridges. One of the sturdiest, longest and most elegant of these structures is the suspension bridge.

A suspension bridge must be balanced to stand up. It uses tension in the cables to create an overall force of compression in the towers.

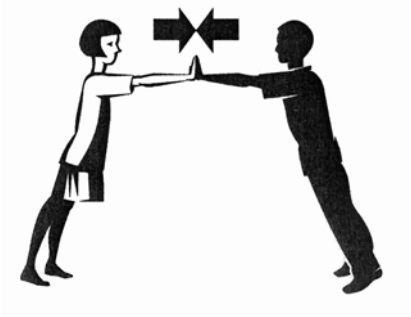
Exploration

Before the students become "engineers" in this activity, they need a short course in engineering principles and forces that help support bridges.

First demonstrate the forces of tension and compression. Ask students to stand, each having one partner. To demonstrate tension, have each team member grasp the other's forearms. Both students lean back. Their arms should stretch out between them. Go around to several pairs and lean gently on top of their arms to test their "structure". Explain that when you lean on them you are pushing down and causing their arms to stretch, or be put into tension.



Have the students remain standing. To demonstrate compression, have partners press the palms of their hands together and lean toward one another. The students will be making an arch with their bodies. Go around



to each pair and push on top of the arches. Explain that when you are pushing down you are causing them to push together, or to be put into compression.

If time permits, ask students to look for elements under tension and compression in their classroom.

Activity

1. To build the human suspension bridge, select 16 students to participate.
2. Two pairs of taller students stand across from each other and hold the "cable" ropes on their shoulders. These students are the towers.
3. Four students act as anchors. Each one sits on the floor directly behind each tower and holds the ends of the cables.
4. Eight students can act as suspenders. Put four in a straight line between each opposing tower. They can kneel or sit while pulling the cables down toward the floor.
5. The floor serves as the roadway. The rest of the students in the classroom can act as cars.

Discussion

Ask the students who are acting as towers to describe what forces are at work in their "bridge". Have them describe how each force works upon them. They should feel the rope pulling down on their shoulders. What happens to the bridge if there are no anchors? If there are no suspenders?

You can also discuss the pros and cons of a suspension bridge.

For instance, these bridges are typically found in large cities with lots of boat traffic. They can be built high above sea, or land, with a large span between their towers, leaving the waterway clear for boats. However, they are very costly in materials and time.

This activity was provided for National Engineers Week by the National Building Museum (NBM) in Washington, D.C. For National Engineers Week 1998, the National Engineers Week Committee will launch an exhibition at NBM called "Breaking Through: The Creative Engineer " The exhibit will examine engineering as a creative process in areas from space exploration and high definition television to bridges and microrobotics For more information, check out the National Engineers Week internet site at http:\\www.eweek.org.