Inquiry Activity: Beam Shape   
and Deflection

If you have ever gone past a construction site or driven over a bridge, you've probably noticed that the supporting beams can take a variety of shapes. In this activity, you will explore how the *deflection*, or "bendiness," of a beam is affected by its cross section. Your goal is to develop a model that will allow you to predict the deflection of a center-loaded beam supported on both ends based on its shape.

MATERIALS

Vernier LabQuest2 or LabQuest Mini

computer

Logger *Pro* software

Vernier Structures and Materials Tester (VSMT)

wood (as supplied by the instructor)

other materials (as supplied by the instructor)

INVESTIGATION Design

1. Brainstorm with your group to determine the shapes of beams you have observed in construction applications. Record your ideas on a piece of paper.

2. Determine which beam shapes you will build with the wood you have been allotted. All of your beams should be constructed with the same amount of wood and be the same length. You should plan on testing at least three different shapes. Draw detailed sketches of the cross section of these beams.

3. On your own, rank the beam designs according to your predictions about their relative "bendiness." When you are done, compare your predictions with the other people in your group. Discuss and record the results of your discussion.

4. Design an investigation to test the deflection of the various beam shapes.

5. Build each of the beams and allow the glue to dry. Conduct the investigation with your team and compile the results. Discuss the results with your peers, and develop a hypothesis that might explain the results.

6. Test your hypothesis with a beam other than those already tested. Remember that when you are testing the variable of cross section shape, everything else about the setup needs to be held constant (e.g., the total amount of wood in the truss and the force applied).

Follow-up Questions

1. What beam shape resulted in the least flexible (stiffest) beam? Articulate a theory for why that shape had the least amount of deflection.

2. Reflect on the results of your test. Did your hypothesis hold up or do you need to revise it based on the testing you performed? Do you think additional testing is warranted? Discuss.

3. Do you think the beam that flexed the most will sustain the least load if tested to failure? Support your idea. Test your theory to see if it is correct.