

Active Learning activity – Suzette R. Burckhard

Title: Compression and tension in materials, Modulus of Elasticity (How to play with your food from an engineering perspective)

Course(s): Materials, Mechanics or Strengths of Materials, Structural Materials lab

Props needed: Marshmallows, caramels, hard candy like butterscotch disks, tootsie rolls (new and old ones are good or keep them in refrigerator before class)

Activity: Demonstrate compression and tension with the marshmallow. Show how pushing on the marshmallow squishes it down and out then show pulling on the marshmallow makes the marshmallow longer and thinner. Have students try the same activity with the caramels, hard candy, and tootsie rolls. If you have the cold tootsie rolls, use the cold ones first then have students use warmer ones or have them warm them in their hands and redo the experiment. Students are asked to estimate the relative change in diameter versus height and to discuss how different factors affect the stretching or compressing such as temperature, speed of force application and type of material. Ask students to estimate the modulus of elasticity for the materials. Discuss how brittle or ductile sample differ in how they react to forces. Have them take pictures of what they are doing.

How does this relate to lecture? Students have little to no information before performing activity. After they are done experimenting for about 15 minutes, have each group report on their results (either have a representative from the group get up and share with the class or have each group at a white board space where they can share). If you are using on-line in a synchronous manner, the pictures and discussion are uploaded to a discussion thread real time and shared. You can end the activity with a clicker based quiz that asks basic questions on compression, tension, brittle versus ductile, and modulus of elasticity relationships.

Lecture time: Use the student's own pictures and examples as you present the theory on compression and tension in solid materials. Have students design a homework problem based on the in-class experiment such as how many marshmallows would be needed to support your book such that the book wouldn't come within 1 inch of the desktop or some other arbitrary value that makes sense.