

## Lesson 1 Introduction – What is an engineer? Plastic rod structures

Objectives: Students will get an overview of the content, structure, and logistics of the class.

Students will understand the behavioral expectations while in class.

Students will explore strategies for building tall, strong structures.

Students will get a first-hand experience with the design process that scientists and engineers use.

Materials: For each student:

- ∞ Interest inventory
- ∞ Pencil

For each group of four students:

- ∞ 25 plastic rods (Find them at RAFT. They were originally used to hold electronic components)
- ∞ 30 rubber bands

For class:

- ∞ Heavy book, Meter stick, More rubber bands

Sponge: Interest inventory

Initial

Discussion: What is an engineer? (quick discussion, write ideas on whiteboard)

Format of class:

Rules/expectations (Be safe, Be considerate)

Grouping

Define problem for the day: Build a free-standing structure out of Plastic rods and rubber bands. (Optional story: Students are test department of a structural engineering company. The R&D department has developed a new building material. They want to know how well it works for making a strong, tall structure.)

Define terms structure and freestanding.

Project: Build a free-standing structure using plastic rods and rubber bands. Build the structure as strong as possible and as tall as possible. A single plastic rod put up as an antenna will not count when measuring height. Students can use no more than 25 plastic rods, but as many rubber bands as they would like.

As students begin work, if some groups are struggling and others have figured out how to attach the plastic rods, have the successful groups show the others what they are doing. Ask: Are there different ways to use the rubber bands?

Optional: Take individual photograph of each student for journal.



Vocabulary: Structure – something that is constructed, such as a building  
Freestanding – able to stand on its own

Final

Discussion: Students walk around the room to see all the projects. Those who want to can share their experience with the entire group.

Take pictures of student projects (optional). Measure height of each structure. If students are willing, test whether structure supports the weight of a heavy book.

Ask the questions:

- ∞ What worked well?
- ∞ What didn't work?
- ∞ What kinds of shapes do you often see in buildings?
- ∞ Are there other shapes that might work well?
- ∞ How could you make your structure more stable?
- ∞ Is there any material not provided that you would have liked to have had?
- ∞ Which structures do you think will be the strongest?
- ∞ Are there any shapes that are common in the stronger structures?

- ∞ Do you think the structure will support a heavy book? If students are willing to try, let the group choose where to place the book. Why did they choose that location? Would the structure collapse if they put the book in a different location?

Hand out small binders or folders with brads and binder paper. Explain that the notebooks will be project journals. Have students put their nametags on the journals and write the date and the problem they solved on the first page of the notebook. Students record height of structure in journal.

#### Home

Connection: Students take home a bag of 50 straws and 50 paper clips to build a project with their families. Caution students that paper clips should not be given to young siblings 3 years old or younger. Ask student to bring in picture or description of any structures they build at home.

#### Alternative

Lesson: If more emphasis is desired on what is engineering and technology, begin with the Museum of Science preparatory lesson, followed by the activity listed as Lesson 16 Alternative Lesson 1 Introduction. Follow the Alternative Lesson 1 with the Lesson 1 described here.

#### Credits:

Idea based on  
<http://thetech.org/education/downloads/dconline/freestandingStructures.pdf>

Home connection is based on:  
<http://www.exploratorium.edu/structures/strawspins.html> and  
<http://www.exploratorium.edu/scale/straws.htm>