## **Lesson:** Balloon Bridges

## **Time:** 80 minutes (two 40 minute periods)

## **Group Size:** 3

## **Materials:**

* 15: [260Q Twisting Balloons](http://www.amazon.com/Qualatex-Balloons-Assorted-Colors-package/dp/B000JCMJCQ/ref%3Dsr_sp-btf_title_1_5?ie=UTF8&qid=1378231555&sr=8-5&keywords=balloon+animals) (per group)
* 15: [.125” x 7” rubber bands](http://www.amazon.com/Alliance-Sterling-Ergonomically-Correct-25405/dp/B001HA8J1E/ref%3Dsr_sp-atf_title_1_2?s=office-products&ie=UTF8&qid=1378232138&sr=1-2&keywords=rubber+bands) (per group)
* Text books or other items to use as weight
* Two chairs
* Scissors
* Safety goggles

## **Constraints:**

* Chairs must remain at least 2’6” apart
* Limited to only 15 rubber bands for the prototype and 15 balloons for the final design
* Balloons must remain deflated
* When weight is added on the bridge, neither weight or the bridge may touch the floor
* If the weight falls off or the bridge breaks, that weight will not count

## **Safety:**

* Eye protection **MUST** be worn at **ALL** times
* Use caution with rubber bands and balloons as they may contain latex

## **Other notes:**

* May need someone to sit in chairs as the tension in the balloons will try to pull them together
* The prototype will be built with rubber bands
* The final bridge will be built with balloons

## **Objectives:**

* Give students hands-on experience in learning the engineering design process
* Give students experience working in a group on an engineering project
* Show that time management is an important factor in project development
* Develop critical thinking and evaluation skills

## **Introduction:**

Engineering design process for the 7th grade level (note that step 8 loops back into step 1):

1. Identify the problem
2. Identify criteria and constraints
3. Brainstorm possible solutions
4. Generate ideas
5. Explore possibilities
6. Select an approach
7. Build a model or prototype
8. Refine the design

## **Procedure:**

1. Introduce bridges and the importance of the engineering design process by showing the Tacoma narrows Bridge collapse.
2. Discuss what the process of building a bridge involves to lead into the engineering design process steps
3. Discuss the engineering design steps 1-8
4. The goal is to build a bridge with the supplied materials between two chairs to hold as much weight as possible.
5. Discuss the constraints
6. Discuss safety precautions
7. Give students 5 minutes to draw a design for their prototype bridge
8. Give students 15 minutes to build their prototype with rubber bands
9. Discuss with the class the results of their prototypes
10. For next time, we will repeat the engineering design process with our experience from the prototypes to make our final balloon bridges
11. For the final design day, give students up to 10 minutes to refine their design
12. Give 10-15 minutes to students to build their final design with balloons
13. Take 5-10 minutes to test each group’s bridge (can make this a contest for extra incentive)
14. Take 5-10 minutes to reflect on the final bridge designs

## **Assessment:**

* What was the best design and why?
* How did your prototype effect your final design?
* How did your group make the best out of the time and materials given?
* What happened to your bridge as weight was added, removed, and added again?
* How did the engineering design process affect the group and the final bridge?