

## Balloon Powered Lego Cars Engineering Design Challenge

8<sup>th</sup> Grade: Checks For Understanding: 0807.T/E.2 Apply the engineering design process to construct a prototype that meets certain specifications.

### Materials and Set Up:

Terrains for testing designs are provided at 3 locations in the classroom:  
They are placed in extra large foil baking pans or cookie sheets.

1. Cotton balls - representing boggy terrains
2. Sand - representing beach or desert terrains
3. Fish gravel -representing rocky terrain
4. Materials for each group: placed in large zip lock bags

- 10 -Lego blocks - medium size (not the minis)
- 4 - large wheels with axels
- 4 - small wheels with axels
- 4 - 9 inch latex balloons
- 4 - straws
- 4- small rubber bands

5. Engineering Design Handout and Lab Sheets
6. Curiosity Rove Landing Video
7. Student Journals/lab notebooks

### Anticipatory Set:

Show video of the landing of the Mars Curiosity Rover:

[http://search.babylon.com/?s=web&babsrc=SP\\_ss&rlz=0&q=youtube+mars+rover+landing+video](http://search.babylon.com/?s=web&babsrc=SP_ss&rlz=0&q=youtube+mars+rover+landing+video)

### Focus Question:

Engineers typically work together to solve the problems that face society. Engineering design is the process of creating solutions to human problems through creativity and the application of math and science knowledge. What does your group feel the basic steps within the design process include?

### **Lesson Instructions:**

1. Following the video, groups discuss the focus question and provide answers in whole class discussions.
2. Distribute student handouts – Steps of the Engineering Design Process and Vocabulary Words.
3. Whole class discussion and introduction to the engineering design process. Students enter the steps of the EDP as a flow chart in journals as the teacher introduces each step.
4. Materials Managers pick up group materials.
5. Groups complete the Engineering Design Challenge:

What balloon powered Lego car design will travel successfully on different terrains?

6. Students Complete Lab Data Sheets

7. Clean up and closure – Groups share designs, communicate challenges and technical difficulties to the class.

8. Exit Ticket:

What step or steps of the engineering design process did your group have the most problems completing? Explain.

What steps were the easiest? Explain.

## **Steps of the Engineering Design Process:**

1. Identifying a problem –  
Observing a problem and seeing a need for a solution.
2. Researching possible solutions or “Brainstorming”  
Coming up with ideas to address the problem.
3. Picking the best solution –  
Determining which idea best addresses the problem. This decision may involve monetary, practicality, material, and property concerns.
4. Building a prototype –  
Build a working model of the chosen design
5. Testing the prototype –  
Be sure the working model solves the problem and holds up to any important material property tests.
6. Communicate and Redesign-  
Complete any steps needed to improve the design

The engineering design process is not always a step-by-step process, as engineers often repeat steps or go back and forth between the other five steps.

## **Vocabulary:**

1. Engineering – the process of creating solutions to human problems through creativity and the application of math and science knowledge.
2. Friction – the force that opposes the motion of a surface that moves against another surface. This is what reduces slipping between the wheels of a car and the road it travels on. The force of friction is extremely dependent on the weight of the moving object.
3. Gearing Down – a small gear to a big gear. This results in the follower rotating much slower than the driver.

Name \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

**Balloon Powered Car – Problem: What design will travel successfully over 3 different terrains?**

Materials Used to Make Your Car	Brainstorming Ideas
1. 2. 3. 4. 5. 6. 7.	1. 2. 3. 4. 5. 6. 7.
Materials Used to <b>BUILD</b> Your Car (Tools) – (if you used glue, scissors, markers, screw drivers, toothpicks, or any other materials)	
<b>Procedures</b> – Written Directions STEP 1	<b>Diagrams</b> – Drawings (label if necessary)
STEP 2	
STEP 3	
STEP 4	
STEP 5	

*Add an additional page if necessary.*

## Challenges and Technical Difficulties

List at least 3 problems you encountered while building or testing your car and what you did to solve them.

<b>Describe the problem. You may also use drawings.</b>	<b>Explain how you solved this problem.</b>
Problem #1	
Problem #2	
Problem #3	
Problem #4	
Problem #5	