Engineering Design Process

1

Identify the Problem

2

Brainstorm

3

Design

4

Build

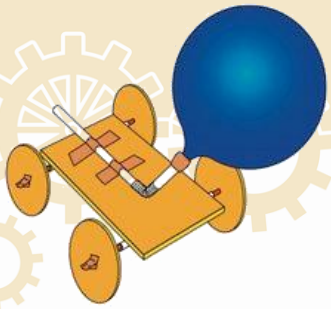
Test & Evaluate

Redesign

5

Share Solution

Balloon Car Challenge



Build a balloon-powered car that will travel 5 feet.

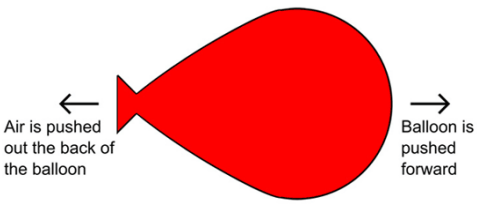
Materials Suggested

- ❑ **Power:** Latex balloons
- ❑ **Car body**: Plastic bottle, plastic cup, cardboard
- ❑ **Wheels**: CDs, bottle caps, empty rolls of tape
- ❑ **Axles**: Wooden pencils, skewers
- ❑ **Other materials**: plastic straws, glue, tape, paper clips, scissors, rubber bands

Engineering Design Constraints

1. The car must be propelled forward by the air escaping the balloon.
2. The car must be sturdy and not fall apart when in use.
3. The car must travel at least five feet.
4. The car must travel in approximately a straight line.

Design Considerations



Have you ever blown up a balloon and let it go? The air rapidly escapes the balloon making it fly away. Your challenge is to harness this energy to propel a car forward!

The balloon-powered car has three main parts: the body, the wheels, and the axles. The axles connect the wheels to the body and allow them to spin. Think about what materials you will use for each part and how they will connect together.

Math Connection

Let's calculate the average speed of your balloon car. The equation for this is:

$$average\ speed = \frac{total\ distance}{total\ time}$$

Measure the total distance traveled in inches and divide by the total time in seconds.

What is your average speed? _____ inches per second

Convert to feet per second: _____ feet per second

STEM Career Connection: Industrial Engineer

Industrial engineers determine the most effective way to use people, machines, materials, information, and energy to make a product or service.

Cool Project: Industrial engineers helped design the Walt Disney World theme parks to maximize enjoyment for visitors including easy access to rides, food, and entertainment. 52 million people visit the park each year!

Learn more: Download the TinkerBox app to play a fun physics and engineering puzzle game!

Engineering Design Process

Name: _____ Due Date: _____

Identify the problem

After reading the Challenge Sheet, describe the goal of the challenge in your own words. Include any important design considerations.

Brainstorm

Review the materials list. The engineering design constraints may require specific materials to be used for the design.

Gather materials and list them in the box to the right. Think about how you can use each material to solve the challenge.

Materials For My Design:

Design

How will you solve the challenge? Sketch at least one design idea, and label the parts of the design and materials used. Use additional paper for more space if needed.

Build

Time to bring your design to life! Using your design sketch as a starting point, build your solution. Keep in mind that materials may not work as you predicted. Engineers often have to make several modifications to their original design before they are successful.

Engineering Design Process

Test & Evaluate

Test your design and record results below. Circle if the challenge was a success. Remember that failure is an important part of the engineering process! After each trial, review the results and make changes to improve your design.

Trial	Results of Test	Challenge complete?	Ideas for Improvement
1		Yes / No	
2		Yes / No	
3		Yes / No	
Continue more trials on another sheet. *How many trials were needed for a successful result?* _____			

Solution

Sketch your final design and label materials used.

Reflect & Share

Answer the following questions. Then share design results with your family/class!

1. What challenges did you face during the design process?

2. How does this challenge relate to the STEM Career Connection?

WANT MORE STEM?

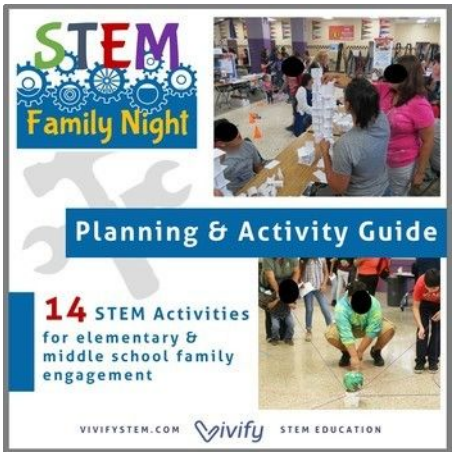
For a complete list of all of Vivify STEM resources broken down by standards, topics, and grade levels, go here: http://bit.ly/VivifyResourceGuide

bit.ly/VivifyMars

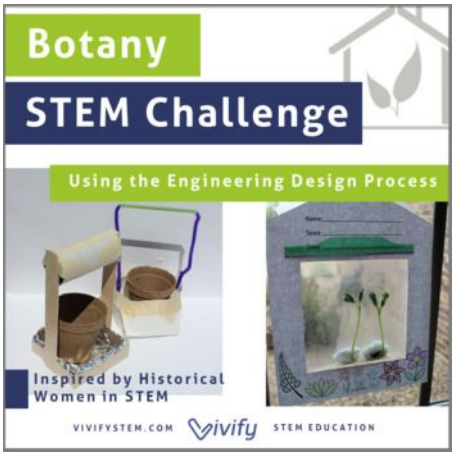
bit.ly/Vivifyspacebundle

bit.ly/icebreakerbundle

bit.ly/Vivifycatapult



bit.ly/STEMfamilynight



bit.ly/Vivifybotany

Vivify's Overview of STEM Education

Successful STEM education is an empowering interdisciplinary approach that brings math and science concepts to life through problems that mimic the complexities and excitement of the real world. STEM revolves around the Engineering Design Process that embraces failure, relies on teamwork, and requires critical thinking and creativity. While exciting, educators often become intimidated as a search for curriculum leads to an overwhelming range of activities from index towers to robotics competitions. At Vivify, we believe that not all STEM is created equal. Educators should adopt a 3 Stages of STEM approach by progressively building towards more complex projects.

To learn more about the 3 Stages of STEM, go here: http://bit.ly/stemstages