TEACHER QUEST TAMPA BAY PROGRAM

ACTION PLAN

Author: Ed Shay
Lesson Title: Soda Bottle Rockets
Grade Level: 6th Grade
Subject Area(s): Earth and Space Science
Date: July 6, 2010

Summer Work Experience

I shadowed a mechanical engineer at Raytheon's Network Centric Systems through part of the design and production process of a communications system. I watched the engineers practice the enhanced communication skills that are necessary in order for their finished products to match the vision and requirements of their customer. I discovered that besides a firm grasp of mathematics and science the engineers needed also to be great listeners, creative and well rounded, because they would spend some of their time as a project accountant, lawyer, and manager.

After three weeks with the engineers I reported to the manufacturing facility. Here I would shadow another mechanical engineer and see the design take shape into a finished product. Although this job was of a very technical nature I discovered that again the central theme was communication. The design provided by the engineers now had to be transformed into a working product. Just like the design phase the production process would rely heavily on the interaction of the engineering design team and the workers responsible for fabricating the product.

This experience was an energizing glimpse of the real world that I must prepare my students to enter. Thanks to Raytheon, TRDA, and the Helios Education Foundation, I will be able to make a bigger difference for my students this year. The insights I have gained this summer at Raytheon will help me to translate to my students the opportunities that await them if they work hard in school.

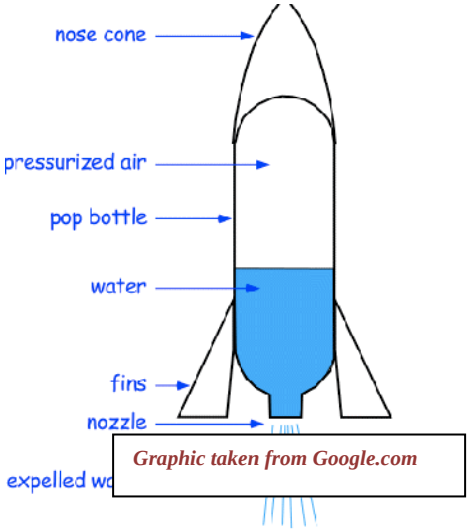
My job for the first three weeks was to help the mechanical engineer verify that the parts needed for the design of the product had the correct dimensions and fit within the parameters of the project requirements. I also attended design team meetings where mechanical engineers would meet with electrical engineers and environmental engineers so that everyone was in agreement

on what effect the work of each group would have on the effectiveness of the design of the finished product. During my time working in the manufacturing facility I tracked the same parts that I had researched for the design phase and helped to incorporate them into the product.

This experience will result in several classroom transformations. I will place more of an emphasis on group work and cooperative learning and stress the importance of clear communication. I will also integrate more mathematics and technology into my curriculum. Having witnessed how a teaming approach increases the effectiveness of operations at Raytheon, I will take this approach back to my academic team. I am going to incorporate an interdisciplinary unit of study surrounding the soda bottle rocket lesson plan. I have prepared a reading unit based up the first moon landing with vocabulary and reading comprehension assessments which will be studied in reading class. I will work closely with the mathematics teacher and coordinate the study of the mathematics underlying the lesson both in mathematics and in my science class. I will invite the language arts teachers to combine with my class for the rocket launches and then the students can write about this experience in class. I have a video based upon the space race that I will give to the social studies teacher and they can study the geography and the geopolitical environment of the time that man first entered space and successfully landed a man on the moon.

A large part of my work experience was spent watching not only the processes and the product but the people. My finished product as a science teacher must be a well rounded science student with great communication skills who is prepared to take the next step toward the possibility of one day entering a STEM career. Thanks to this opportunity to see the actual application of scientific principles utilized by scientific professionals, I will be able to more effectively prepare my students for a STEM career in science, mathematics, technology, and engineering.

Soda Bottle Rocket



Experiment Lesson Plan

Objectives:

1. The students will be able to explain how Newton's third law causes the rocket to fly.
2. The student's will be able to identify and explain the force that creates the thrust and how it is responsible for the rockets motion.
3. The students will be able to graph the flight of the rocket representing height over time.

Sunshine State Standards

(SC.C.2.3)

The student understands that the types of force that act on an object and the effect of that force can be described, measured, and predicted.

(SC.C.1.3)

The student understands that types of motion may be described, measured, and predicted.

Materials

1 soda bottle for each group	construction paper
scissors	tape
funnels	safety glasses
rocket launcher	markers
graph paper	

Instructional Procedures

1. Students will work in cooperative learning groups to design a nose cone and fins and fasten them to their rocket. Striping may be added to the sides of the rocket but you want to be able to see the water level and the space for the air in the rocket.
2. Students will be asked to cooperatively design a launch platform and present this design to the other students.
3. Student groups will fill half of the volume of their rockets with water and go outside to the rocket stand.
4. Students will attach their rockets to the rocket launcher and add ten pumps of air to the rocket. (Counting backwards from 10 as a countdown.)
5. As the final pump of air is added to the rocket the launch cord is pulled to release the cork and the pressure is released and the rocket flies.
6. Students will use the height (calculated earlier) of a nearby tree as a reference to determine the flight path of their rocket.
7. Each group will film their launch. This video will be used for post launch analysis determining height, and flight time so that the speed of the rocket can be determined using (d=rt).
8. Using estimated data from the video the students will create a height vs. time graph.
9. Students will work together to create a podcast documenting the event to share with the rest of the school and displayed on our classroom web site.

Integration of Summer Work Experience/Follow-up Activities

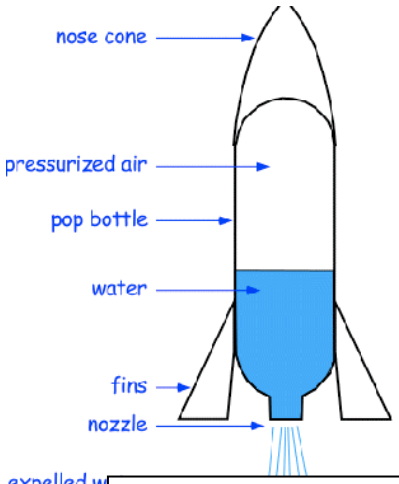
1. The cooperative group structure and authentic workplace scenario incorporated into this student experience are designed to mimic a real world work place where communication of ideas and requirements are issues that are the key to efficiency and productivity.
2. The rocket design of the nose cone and fins expose the students to the level of creativity necessary to transform their design visions into a working product.
3. The analysis of breaking the flight of the rocket into small segments by using frame by frame video will help the students to witness the action reaction that occurred in front of them at a speed were they can see what actually happened and better understand the process. The frame by frame approach is a direct correlation to the approach I observed engineers use as they would break down complex problems into smaller pieces that were manageable.
4. Student accountability will be measured by their success level on the assessment activity and their responses to verbal questioning.

Comments

The students enjoy the frame by frame video slow motion. This provides them with a true accounting of the experience that in real time moves to quickly for proper observation. The students also have fun creating the podcast.

Soda Bottle Rocket

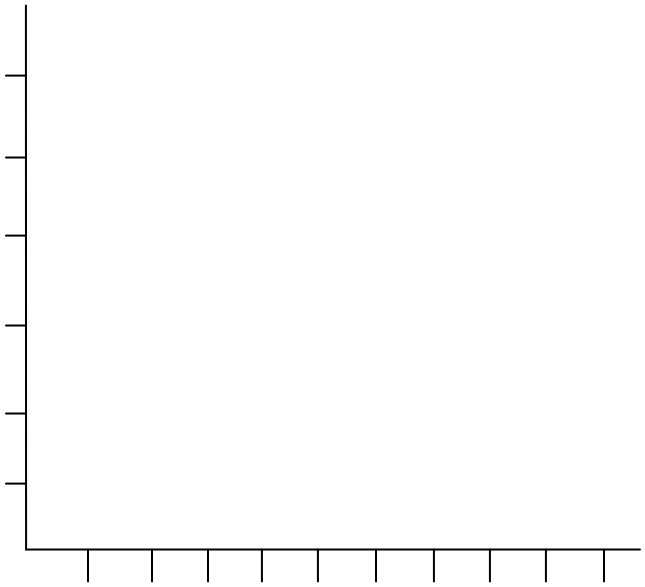
Experiment Assessment



Graphic taken from Google.com

1. Use the following data from a rocket flight to create a graph and answer questions 2 and 3.

Time (sec.)	Elevation (ft.)
1	20
2	40
3	60
4	80
5	60
6	40
7	20
8	0



Time (sec.)

2. How long did the flight last? _____

3. What was the elevation of the rocket after 6 seconds? ____

4. If the rocket rose 60 feet in 3 seconds then how fast was the rocket rising if the speed equals the distance divided by the time? (speed = distance / time)

   _____

5. What units would you use for your answer? _____

6. Using the tree we measured earlier as a reference, how high do you think your rocket flew? _____

7. What was the top speed of your rocket? _____

8. How could you make it fly faster, or slower?

_____

_____

Could the rocket become dangerous if you put too much air in the bottle?

_____

9. Explain how the soda bottle rocket works?

_____

_____

_____

10. Which one of Newton's laws of motion caused your rocket to fly

_____

11. What was the action? _____and what was the reaction?

_____