1-13-2015

Theme B: Day 6 Plan

Purdue University College of Education

THEME B

Becoming a Spacewalker: My Journey to the Stars by Astronaut Jerry L. Ross

DAY SIX STEM EXTENSION TO ACCOMPANY DAY SIX SHARED READING OF *SCIENTIFIC CURIOSITY*

To Ponder: Jerry Ross wanted to know how rockets were propelled into the sky, so he experimented with model rockets. Let's have a blast with the balloon rocket experiment. (Show students the set-up experiment.) I wonder what will happen if we change the condition like the diameter of the straw? Could this condition change make a difference in how our rocket is propelled and the distance it travels?

SCIENCE/TECHNOLOGY/ENGINEERING/MATEMATICS (STEM) ACTIVITIES:

Science Investigation: *BLAST OFF!* The Balloon Rocket Experiment. Let's investigate the world of rockets using very simple and safe materials.

STEM objectives: To explore propulsion and the impact of various conditions using rocket balloons

Vocabulary: propelled, blast, payload, miscalculation, countdown

Goal: To investigate a balloon rocket and the distance traveled and to investigate how changed conditions impact data results

Purpose of Science Activity: To explore the world of rockets using very simple and safe materials

Materials: safety glasses/goggles, balloon(s), some cotton thread or string, straws (various diameters), sticky tape, a tape measure, a stopwatch, science notebook/journal/iPad/SmartBoard/computer, smartphone

Link: Jerry Ross was fascinated with rockets and how they blasted off into the sky. This highly intense curiosity stayed with him throughout his life so much so that he spent his career still exploring his childhood dream.

STS-74 Flight Day 1 *Atlantis* Liftoff! (November 12, 1995)
https://www.youtube.com/watch?v=Xk0tdqxjGq8 (Time: 17:46; Student viewing: 12:00–17:46)

Before Activity:

- *Activate prior knowledge:* What do we know about model rockets and the impact of gravity?
- *Prompts to encourage prediction:* If we were to use simple and safe materials to build a balloon rocket, what do you think could happen?
- *Draw on personal experience:* We know what happened to the precious payload when Jerry Ross miscalculated. Have you ever made a mistake and had to try again?
- *Set a purpose for experiment:* To investigate a balloon rocket and the distance traveled while changing a condition
- *Draw or write predictions of the balloon rocket experiment:* What do you think will happen?

During Activity:

1. Students have alone time to think about their experiment predictions. Record/illustrate in selected science notebook. (1) How far will the rocket travel? (2) How fast will the balloon rocket travel?
2. Share predictions with partner.
3. Discuss in large group.
4. Place safety glasses/goggles over eyes and set up experiment. Push cotton string/thread through straw and stretch across room. Pull taut and secure the ends to two chairs using sticky tape.
5. Next, blow up the balloon and hold the end closed without letting the air escape. While continuing to hold the end of the balloon, have the student tape the straw in two places, one at each end of the straw, to the top of the balloon. (The straw is on top and taped to the top of the balloon; the balloon opening is facing in the right/east position.) Once secured, release the end of the balloon and see/hear the balloon go flying along the string across the room. You can use a stopwatch to time the balloon as soon as it is released. Then, measure the distance traveled using a tape measure. Be careful not to miscalculate distance with the tape measure or time with the stopwatch! Know the units of measure you will be using.
6. Discuss trial #1 observations with students. Have students sketch what happened and record time and distance measured.
7. Complete at least 10 trials, giving students turns completing the experiment tasks. (Set up data sheet to show at least 10 trials with time and distance measured.) Discuss in large group.
8. Optional conditions and experiment extensions: Change the straw. There are many diameters available as well as straight (180 degrees) versus flexible straws that can be bent to resemble curved/acute/obtuse/right angles. I wonder what these results would look like.
9. Optional student opportunities: (1) Use a smartphone to take pictures of trials, emphasizing sequential order and scientific procedure. (2) Utilize student artistic sketches and impressions to illustrate what happened in the experiment. Also, provide time for the writers to create the captions for the photos/sketches of the experiment. (3) Extend an opportunity for the mathematical/technical-minded students to input the classroom data into an Excel/software spreadsheet. The software may also figure average speed as well as distance traveled. (4) Design an experiment wall to showcase the scientific process and their results.

After Activity: What does your evidence show?

- *The "balloon rocket experiment" evidence showed that* _____.
- *My conclusions about this experiment are that* _____.

Extensions: Today, we learned about rocket propulsion, speed, distance, and payload. Since our world thinks "green," would it be possible to store the pressure energy from our balloon rocket to possibly be used later by solar and wind energy products? The following resources will further extend your scientific curiosity.

Resources:

STS-74 Flight Day 1 *Atlantis* Lift Off! (November 12, 1995)
https://www.youtube.com/watch?v=Xk0tdqxjGq8

The Balloon Rocket Experiment
https://sciencebob.com/make-a-balloon-rocket/

BLAST OFF! The Balloon Rocket Experiment

Predictions

1) How far will the balloon rocket travel? I think that the balloon rocket will travel _____in/cm.

2) How fast will the balloon rocket travel? I think that the balloon rocket will travel _____sec.

Balloon Rocket Results Lab

Trial #	Time (sec)	Distance (in/cm)
Trial 1		
Trial 2		
Trial 3		
Trial 4		
Trial 5		
Trial 6		
Trial 7		
Trial 8		
Trial 9		
Trial 10		

Extensions:
1) Students can enter data and create a spreadsheet to record/analyze the results.
2) Student can also calculate average time and distance traveled.
3) Your STEM choice.