Environmental Science Institute
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Launch It

Lesson plan for grades 6-7 and 11-12
Length of lesson: 50-60 minutes
Adapted by: Cherish Park, Environmental Science Institute, November 2011

SOURCES AND RESOURCES:

Authored by NASA – A Teacher's Guide with Activities www.nasa.gov

POTENTIAL CONCEPTS TEKS ADDRESSED THROUGH THIS LESSON:

§112.18. Science, Grade 6: 11C
§112.19. Science, Grade 7: 9B
§126.33. Astronomy, Grades 11-12: 2E, 2F, 2G, 14A, 14B, 14C, 14D, 14E

PERFORMANCE OBJECTIVES:

Students will be able to:

- Design and build a rock from a straw
- Infer how far the rocks will travel
- Measure, record the distance the rocket traveled
- Improve their rockets based on testing results
- Explain the reasons for the differences distance traveled for their rockets

MATERIALS (per group of three):

- Balloon
- Small lump of clay
- Paper
- 1 wide straw
- 1 thin straw that can fit inside the wide straw
- Tape
- Target (may have a bull's-eye drawn on)
- scissors
- Science journal for recording data and observations
- A meter stick (or any type of ruler)
- a meter-long string

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ENGAGE

Divide the class into groups of 3 or in partners. Students are to work in their groups with NO assistance from phones, computers, or reference books – they may only use their own minds and group collaboration to brainstorm.

Ask: What are some things that the astronomers should consider when launching a rocket?

Note to teachers: This could be an opportunity to introduce or review the terms potential and kinetic energy, and to introduce the distance-angle relationship and the path of a moving object, allowing the students to infer some of the factors that may influence their rockets traveling distance and the trajectory.

EXPLORE:

1. Divide students into small groups, each with each one of the materials listed above.
2. Students should construct three different T- tables in their science journals to record their data during this investigation. One T-table will be labeled with the trial number and the distance it traveled. The second T-table will be labeled with the circumference of the balloon and the distance it traveled. The last T-table will be labeled with angles and whether it hit the bull's-eye or not.
3. Groups are to cut the think straw to about 1 to 2 inches (approximately 3 – 5 cm). Then slide the cut out piece into a balloon. CAUTION: do not slide the straw all the way in but just enough to function as a bridge between the balloon and the wide straw.
4. Tightly seal the straw to the balloon with a tape.
5. The wide straw will be used to represent the body of the rocket. Seal one of the ends of the wide straw by either using a ball of clay or folding the tip and taping it.
6. Blow up the balloon through the thin straw. Do not let go of the air.
7. Slide the wide straw onto the thin straw and launch the rocket, the wide straw. Repeat the step and record the distance it traveled. Are the distances traveled constant throughout this exercise?
8. Repeat this exercise by increasing the volume of the balloon to allow the rocket to travel further. Students will use the string provided to measure the circumference of the balloon. This may not be exact because a balloon is a not perfect circle. Try to measure the widest part of the balloon. Launch the rocket and record the distance. Repeat this step several times with different circumferences of the balloon to see how the size of the balloon affects the distance it travels.
9. Repeat this exercise by launching the rocket from different angles (for example, measure out 30◦, 45◦ 60◦, 75◦, and 90◦) and try to hit the bull's-eye. Record the angle measurement, whether it hit the bull's-eye and observations made onto the scientific journal. How does the angle of the rocket as it launches affect the distance and the target you are trying to hit?

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EXPLAIN AND ELABORATE:

The class can discuss the following questions and write responses in their science journals:

- Were the student hypotheses correct? Why or why not?
- What trends did the students observe? Examples:
    - Compare the size of the balloon and the distance it traveled. How does the size of the balloon affect the distance it travels?
    - Compare the angle of the launch and the probability of hitting the target. Is there an angle measurement that allows the rocket to hit the target precisely?
    - Describe the potential and kinetic energy during each exercise.
- Were the trends the same across all of the groups?
- Based on observed results, what factors affected the launching of the rocket? What should be considered when creating and launching a rocket?

Students in groups may look up information about the factors that cause the launching of the rockets and see if they can come up with different factors that may increase their chance of hitting the target.
Further discussion topics:

- What were the potential and kinetic energies during each exercise? [Blowing up a balloon stretches the rubber, which stores energy as potential energy. When the pressurized air inside the balloon rushes out, the potential energy changes to motion energy (kinetic energy), making the rocket move.]
- What is the distance-angle relationship of an object in flight? [Students will be able to see the changes in travel distance and the shape of the flight path when the rocket is launched at different angles.]
- What was the path of the moving object? [The rocket will travel in a curved path, also known as a trajectory.]

EXTENSION:

1. Students may continue this exercise by adjusting the size of the straw and testing out the distance it travels and compare it with different sizes of the straw. Also students may experiment with the weight of the rocket. For instance, adding more weight to the rocket by adding more clay onto the rocket to see how that affects the rocket and its traveling distance.
2. During the experiment, discuss what change brought best result and why. How did the change in the size of the balloon affect the distance the rocket traveled? How did changing the measurement of the angles affect the way the rocket flew?