Making Bottle Rockets

Dark Skies, Bright Kids
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Activity Time: 35 min
Prep Time: 10 min

Grade: 4th

Standards of Learning Topic

- Primary SOL
  - Science 4.2: The student will investigate and understand characteristics and interactions of moving objects. Key concepts include
    a) motion is described by an object's direction and speed;
    b) changes in motion are related to force and mass;
    c) friction is a force that opposes motion;
    d) moving objects have kinetic energy

Description

This lesson introduces the concepts related to rockets. Students create their own rockets and make predictions about how their rockets will behave after launch.

Materials

- Teacher needs
  - Water rocket launcher
- Each group needs
  - 2-liter bottle
  - Cardboard
  - Tape
  - Glue
  - Scissors
  - Art supplies

Alternate Materials

- Building instructions for DSBK's soda bottle launcher are included in the resources section.
- Different soda bottles have slightly different openings. Most launchers will only work well for one type of soda bottle.

Goals

- Demonstrate the basic force concepts related to Newton's laws of motion
- Create rocket designs and test their capabilities

Introduction to Topic

See NASA's exploration website for an introduction to water bottle rockets.
http://exploration.grc.nasa.gov/education/rocket/rktbot.html

Pre-Activity Instruction

Discuss different rockets and their designs with your students.

Preparation

1) Have rocket construction materials out on tables.
2) Create some examples of rocket designs.

Procedure

1) Give Rockets presentation and emphasize the characteristics of modern rockets (fins, nose shapes, nose cones).
2) Have the students design their rocket (individually or in small groups) – encourage them to be creative with their design (fin shape, nose shape, number of fins, whether to have a nose cone).
3) As students use craft supplies to construct their rockets, be available to give guidance and reminders as needed.
    a. Encourage students to decorate and name their rocket – remind them of the names of historical rockets and the designs on them.
4) Get the students to clean up and put their bottle rockets together at a location of your choosing and have them gather for closure.
5) You can launch the rockets next or later following your launcher's instruction.

Post-Activity Discussion

- *What do you think are some good ideas in your designs?*
- *What do you think will happen when you launch your rockets?*
- *How do you think they will fly?*

Extensions and Related Activities

- Related Lessons:
    - Rocket launching
    - Making kit rockets
- Wiggle Time Activity: Payload Races
- Give students a goal to create the rocket that will go the highest, farthest, etc…
- Bottle rocket carrying payload
    - Instead of just having a nose cone, make an extension that can house a cushioned egg payload and put a cap-cone on the payload. This is so the egg will fit in and the nose that will form the top of the rocket.

Resources

- Pictorial History of Rockets
  www.nasa.gov/pdf/153410main_Rockets_History
- Launch altitude tracker to measure rocket height
  www.nasa.gov/pdf/153402main_Rockets_Launch_Altitude_Tracker.pdf

Glossary

- *Acceleration* – The rate at which an object's velocity changes

- *Energy* – The capacity for a system to do work
- *Fin* –
- *Nosecone* – The cone shaped part of the rocket
- *Velocity* – An object's speed in a given direction