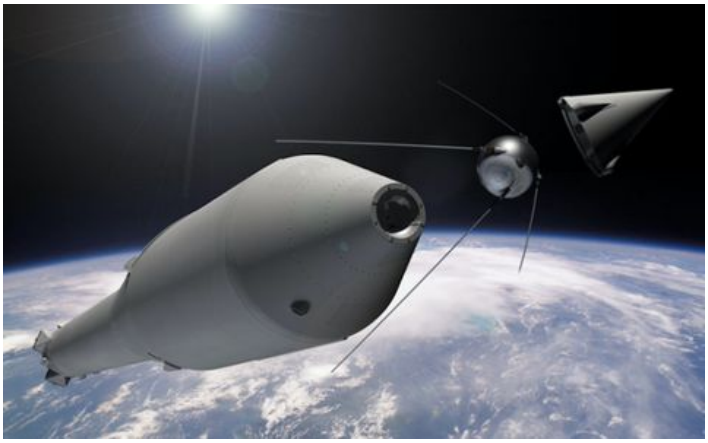
Rocket Exploration



Overview

This lesson will introduce your students to the scientific method using a fun, hands-on activity. The paper rocket is a fun, hands-on way to teach STEM. Students will construct a paper rocket, using paper, pencil and tape to investigate thrust and drag. Students will design, build, test and collect data using the paper rocket they engineer.

Education Standards

Science
(3.6B) Changes in Motion and Position (Force, Motion, and Energy)
The student is expected to demonstrate and observe how position and motion can be changed by pushing and pulling objects to show work being done such as swings, balls, pulleys, and wagons.

Materials

- Paper (card stock and regular construction paper)
- Scissors
- Tape (clear and masking tape)
- Drinking straws
- Tape measure or meter stick
- Straw Paper Rocket directions (or print QR code handout)
- Rocket Exploration Data Collection Sheet
- The Space Race video: https://www.youtube.com/watch?v=xvaEvCNZymo&t=32s

Vocabulary

- Force
- Push
- Pull
- Thrust
- Drag
- Gravitational force

Student Objectives

The students will work in a team environment to perform in front of peers. They will build, test and collect data using their paper rocket model. Teams will make and record observations based on their test rocket launch.

Activity

Before prep:

- Build a rocket in advance to use as a demo.
- Mark of a launch pad and landing area in the hallway or classroom using masking tape (suggested size: 5 to 8 meters long)

Activity:

1. Show the following video titled ***The Space Race (1955-1975)*** to engage students: https://www.youtube.com/watch?v=xvaEvCNZymo&t=32s
2. Do a simple activity with students to demonstrate the concept of applying force and motion to make an object move.
    a. Have students crumb a piece of paper and throw it across the room. Ask students what caused the paper to move? Was it a force? If so, was it a push or a pull? Repeat the motion while explaining to students that you are applying a force with your arm to make the paper move. Then ask the students what caused the paper to drop. Repeat the motion one more time and explain that gravitational force applied to the paper ball caused it to drop. What happens to an object with a force acting on it? It accelerates.

3. Explain to students that in this experiment they will be constructing a small version of a rocket, since real rockets can't be built in the classroom (a little humor goes a long way). The paper rocket students will construct will have three sections: tube, nose and fins.
4. Show students the rocket built prior to the lesson and explain how it works.
5. Take them through the steps of making one (see handout) or share the QR code card and have them watch the video on how to create one on their own.
6. Ask students questions to prompt their thinking:
    a. How does the length of the paper rocket affect how far it flies?
    b. Does the shape of the cone affect its flight?
    c. Does the placement of the fins affect the overall rocket performance?
7. Test the experiment.
    a. In the classroom or the hallway, create a launch pad and a landing area with masking tape.
    b. During construction of their design, teachers should allow students the opportunity to test their design on the launching area. Students may then use this information to make small adjustments to their design before the final launch.
8. Final Launch.
    a. Invite all students to gather around the area at a safe distance from the landing area to view the teams launch their paper rockets.
    b. Review safety with students including not aiming the paper rocket directly at any student. Aim towards the launching pad. Only one team in the launch area at a time.
    c. Teams will launch their paper rocket three times (three trials).
9. Analyze Data and Draw Conclusions.
    a. Students will use the Rocket Exploration Data Collection Sheet to record the distance of their trail runs.
    b. As a group, discuss the results. Allow students to share their thoughts on why some designs went a farther distance than others.
    c. Ask students: How did you get your paper rocket to launch? Which force was applied? Was it a push or pull?

Extension

Students could create three different paper rocket models and test the designs to see what design performs better than the other. Students could create a "target" to aim their rocket. Teams earn points if their rocket reaches the target.