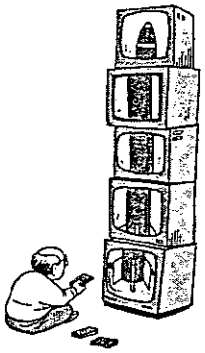
Discovering STEM Program

Paper Rockets

Description: In this activity, students construct small flying rockets out of paper and propel them by blowing air through a straw.



Recommendations for Groups: Upper elementary groups of one or two.

Estimated Time: 10-15 minutes.

Key Questions: How can we build a paper rocket? What makes one rocket perform better than another?

Content Expectations Addressed: Inquiry involves generating questions, conducting investigations, and developing solutions to problems through reasoning and observation.

Inquiry includes an analysis and presentation of findings that lead to future questions, research, and investigations.

Reflecting on knowledge is the application of scientific knowledge to new and different situations. Reflecting on knowledge requires careful analysis of evidence that guides decision-making and the application of science through history and within society.

Earth pulls down on all objects with a force called gravity. With very few exceptions, objects fall to the ground no matter where the object is on the Earth.

A force is either a push or a pull. The motion of objects can be changed by forces. The size of the change is related to the size of the force. The change is also related to the weight of the object on which the force is being exerted. When an object does not move in response to a force, it is because another force is being applied by the environment.

An object is in motion when its position is changing. The speed of an object is defined by how far it travels divided by the amount of time it took to travel that far.

Forces have magnitude and direction. Forces can be added. The net force on an object is the sum of all the forces acting on the object. The speed and/or direction of motion of an object changes when a non-zero net force is applied to it. A balanced force on an object does not change the motion of the object.

Motion can be described by a change in position relative to a point of reference. The motion of an object can be described by its speed and the direction it is moving. The position and speed of an object can be measured and graphed as a function of time.

Teacher Background: This paper rocket activity demonstrates how rockets fly through the atmosphere. A rocket with no fins is much more difficult to control than a rocket with fins. The placement and size of the fins is critical to achieve adequate stability while not adding too much weight.

Science Process Skills: Constructing, predicting, and experimenting.

Materials: Scrap bond paper, cellophane tape, scissors, sharpened fat pencil, milkshake straw (slightly thinner than the pencil), and metric measuring tape.

Procedure:

Constructing the Rocket

(Instructional diagram is available to make copies)

- Roll 4 x 28 cm paper strip tightly around fat pencil
- Tape tube in 3 places
- Cut off ends
- Cut out fins in any shape you like.
- Fold out tabs and tape fins to tube
- Fold over upper end and tape shut

  Insert straw into the open end of the rocket
- Blow through the straw to launch

Caution: **Be careful not to aim the rocket toward anyone because the rocket could injure an eye!**

Teacher Tips:

- Pre-cut the strips of paper for the students to use for rocket construction.
- Have a sample of the rocket constructed for the students to examine.
- Demonstrate the steps of construction with each group of students before they construct their rockets.

Teaching Notes and Questions:

- Try flying a paper rocket with the fins placed on the front end of the cylinder.
- Also try attaching delta- shaped wings to achieve a gliding flight.
- How small can the fins be made and still stabilize the rocket?
- How many fins are required?
- What will happen to the rocket if the lower tips of the fins are bent pinwheel fashion?
- Test fly different paper rockets to see which ones will travel higher or farther.
- Investigate the designs of the rockets that travel the farthest and shortest distances.
- What makes one rocket perform better than another? (Do not forget to examine the weight of each rocket. Rockets made with extra tape and larger fins weigh more.)
- Are rocket fins necessary in outer space?

Extensions:

Try to determine how high the rockets fly. To do so, place masking tape markers on a wall at measured distances from the floor to the ceiling. While one student launches the rocket along the wall, another student compares the height the rocket reached with the tape markers. Be sure to have the students subtract the height from where the rocket was launched from the altitude reached. For example, if students held the rocket 1.5 meters from the floor to launch it, and it reached 4 meters above the floor, the actual altitude change was 2.5 meters.

Resources:

Homepage of NASA Teacher's Resource Center on the Internet