Investigation Five – Balloon Rockets

Standard III
Students will understand the relationship between the force applied to an object and resulting motion of the object.

Objective 2
Demonstrate that the greater the force applied to an object, the greater the change in speed or direction of the object.

Intended Learning Outcomes
1. Use science process and thinking skills
2. Manifest scientific concepts and principles
3. Understand science concepts and principles
4. Communicate effectively using science language and reasoning.

Standard III

Objective 1

Background Information

The balloon is made of rubber and has shape that it prefers. It will return to that shape when it can. When the balloon is inflated, the rubber is stretched way past where it wants to be. As soon as it gets a chance, the rubber will push the air out of the balloon and return to its original shape.

Pre-Assessment/Invitation to Learn

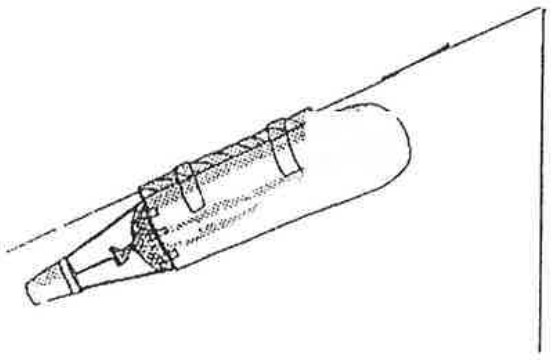
Tell students the balloon is lazy. It likes to stay flat and lifeless. Have a volunteer blow up the balloon. Ask the students what the lazy balloon wants to do. Does it want to return to its "lazy" state? Tell the students that they are going to get a lazy balloon to do some work before they let it resume its flat, lifeless state.

Materials
- Long balloon
- Straw
- String
- Paper cup
- Nuts and bolts
- Tape
- Stopwatch

Instructional Procedure

Activity 1

1. Thread a piece of string through a straw.
2. Attach the ends of the string to the ceiling and the floor. (You can also have a child stand on the chair and hold the string.)
3. Tape an inflated balloon to the straw.
4. Predict what will happen when you release the neck of the balloon and how fast the balloon will travel.
5. Do the experiment and observe what happens. Time how quickly the balloon rocket goes up the string. Design a chart to record the results.



Activity 2

1. Attach three strings to a paper cup.
2. Tape the strings to the inflated balloon so that the cup is suspended like a gondola beneath it.
3. Predict what will happen when you release the neck of the balloon. Predict how fast the balloon will travel.
4. Do the experiment and observe what happens. Time how quickly the balloon rocket goes up the string. Record the results.

Activity 3

1. Do experiment 2 several times, but now add weight (nuts and bolts) to the paper cup. Use a different weight each time you launch the rocket.
2. Predict what will happen to the balloon rocket as more weight is added.
3. Predict the maximum weight the balloon rocket can lift.
4. Do the experiment until the balloon rocket will no longer lift-off.
5. Record the results.

Curriculum Extensions

Language Arts –

- Create a Venn Diagram comparing the different balloon flights. How were they the same? How were they different?
  (*Standard VII, Objective 2*)

Materials
- Soft plastic bottle, with a pop-up lid
- Modeling Clay
- Two straws (one smaller than the other one in diameter)
- Scissors
- Rulers

Science –

- Make a Straw Rocket (*ILO 1*)

1. Cut both straws "6" in length.
2. Make four 3/8" slits around one edge of the smaller diameter straw.
3. Bend the four sections out (should look like an X or a + sign).
4. With the cap closed, place the slit end of the smaller straw in the center of the lid. Secure in place with the clay. This is your launch pad.
5. Make a nose for the rocket (large diameter straw) with a small amount of clay.
6. Slide the rocket over the launch pad.
7. PREDICT what will happen when the plastic bottle is squeezed firmly.
8. Actually squeeze the bottle and OBSERVE what happens.
9. Does it make a difference how hard you squeeze the bottle? Try it to find out.

Assessment Suggestions

Did the students complete the Balloon Rocket Observation Log accurately? Were their predictions accurate as they filled out the chart?

Resources

Materials
- Instructions
- Soft plastic bottle, with pop-up lid
- Two straws (one smaller than the other one in diameter)
- Modeling clay
- Scissors
- Ruler

Books:

- *Tell Me How Fast It Goes (Whiz Kids)* by Shirley Willis (Franklin Watts)
- *Feel the Wind* by Arthus Dorros (Children's Book)
- *The Berenstain Bears Science Fair* by Stan and Jan Berenstain (Random House, Inc.)
- *Gizmos and Gadgets: Creating Science Contraptions that Work and Knowing Why* by Jill Frankel Hauser (Williamson Publishing)
- *Forces* by Graham Peacock (Steck-Vaughn)

Laser Discs:

- Windows on Science, Primary Vol. 3, Force and Motion Lessons 6-10, 14-

Websites:

- http://.enc.org/weblinks/science/0.1578.1%2DForces.00shtm
- http://www.enc.org/weblinks/science/0.1578.1%2DMotion.00shtm

Homework & Family Connections

Have the students make a straw rocket at home.

Name _____

Balloon Rocket Observation Log

Experiment 1: How fast did the balloon climb the string? _____

Experiment 2: How fast did the balloon climb the string with the cup attached? _____
Experiment 3: How much weight do you predict must be added to the balloon rocket before it won't lift-off any more? _____

Weight	Time need to climb the string

At what weight did the balloon finally fail to climb? _____

Was your prediction about how much weight the balloon rocket could lift correct? _____

If not, by how much weight was your prediction off? _____