

Rocket Science

Teacher Directions: Space rockets need to use a great deal of force to be propelled into outer space. What is it that causes the forward motion of a rocket? The following physical science activity will illustrate for your students Sir Isaac Newton’s theory that “for every action there is an equal and opposite reaction.” In this case the “action” of the gases escaping the balloon will cause the “reaction” of the rocket moving forward.

Materials:

- 1 hot dog-shaped balloon (total number of balloons depends on whether your students will be doing this in groups or as individuals)
- 1 piece of string at least 10 feet (3 meters) long
- 1 drinking straw
- masking tape
- yardsticks or measuring tapes
- a copy of the data capture sheet and diagrams for each group (page 67)

Procedure:

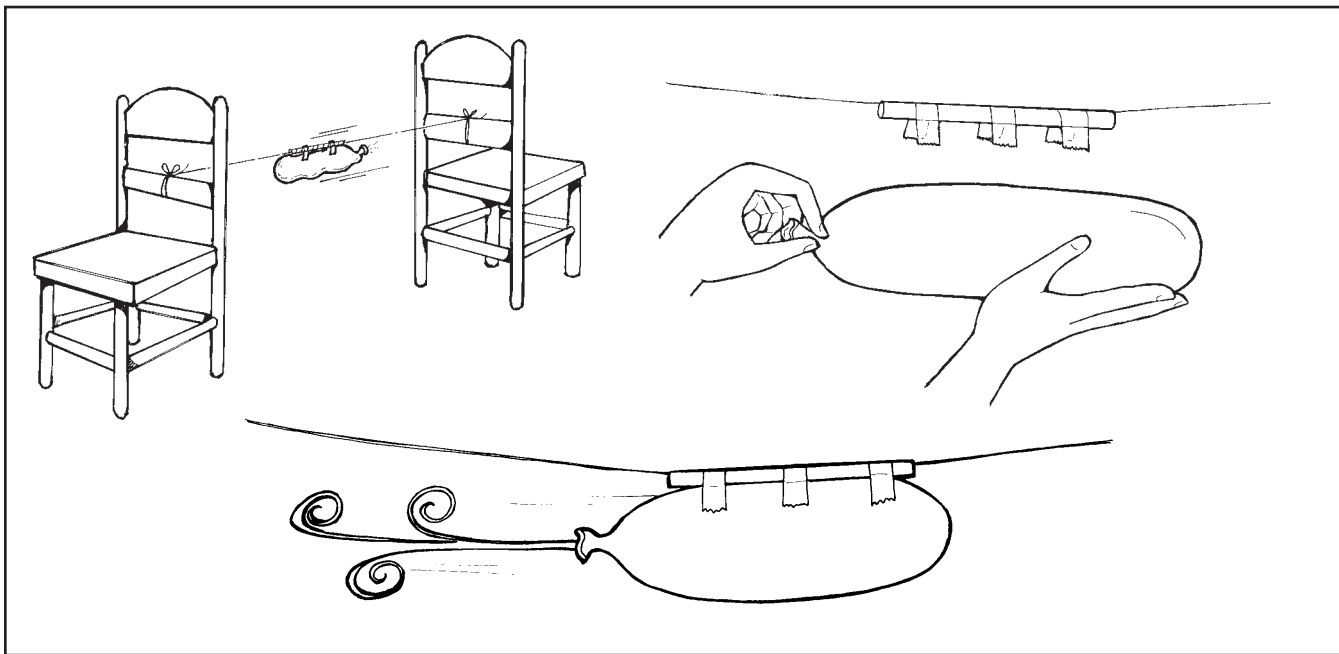
1. Feed the string through the straw.
2. Determine a flight pattern for the rocket. There are a variety of options, all of which can be employed for comparative purposes. Here are some suggestions:
 - Two students hold the ends of the string in a level fashion.
 - Attach one end of the string to the wall with tape or a pushpin. (Be sure the string is level with the student.)
 - Attach one end of the string to the ceiling.
 - Attach each end of the string to the back of a chair. (This option has been illustrated for you on page 67.)
3. Attach three pieces of tape to the straw. Inflate the balloon, but just pinch it off instead of tying it. While pinching the balloon, attach it to the straw and tape. (See the diagram on page 67.)
4. Make predictions about the distance the balloon will travel. Discuss whether the direction (up or across) will make any variation. Record predictions.
5. At the starting signal, instruct the students to release the balloons and watch them fly across (or up) the strings. (See the diagram on page 67.)

You may wish to extend this activity by having your students add additional balloons (increased thrust) and weight (increased load) to the experiment and observe the results. Also, try balloons of different shapes and sizes and observe and record any variations in speed and distance.

Finally, ask your students to summarize the phenomenon of force that was used in this experiment. Students should complete the data capture sheet in order to help them reconstruct and explain the experiment. Through group discussions, encourage your students to come up with some universal principles that were used.

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Data Capture Sheet



Initial Estimate: With your partner or group, make an estimate of the distance the rocket balloon will fly before coming to a stop. (Be sure to include the unit of measurement.)

Our measurement estimate is _____.

Actual Measurement: Measure the distance the rocket balloon flew from starting to stopping point.

The actual measurement was _____.

Difference: If there is a difference, do the necessary calculation and record the answer.

The difference between our estimate and the actual measurement is _____.

Now try creating a different flight pattern. Follow the above format for the next set of rocket trials. Be sure to note any changes of variables that you might add, such as using the ceiling, a wall, two people, etc.

Estimate	Flight Pattern	Actual	Difference