# May the Force Be With You

## Summary

This hands-on activity will help students understand that greater the mass of an object, the greater the force needed to change its motion.

## Materials

Marshmallow Launcher

24" of 1/2" PVC pipe and accessories: two 45° elbow joints, one T-Joint, 1 end cap
Thin plastic
Mini marshmallows
Long tape measurer

- Marshmallow Launcher data recording sheet (pdf)
- Classroom Grid (pdf)

Peak flow meter

Skimmer Kit - A World in Motion

- Classroom Materials Kit order form (pdf)

Additional Resources

*Books*

- *The Gadget War*
  , by Betsy Duffey; ISBN 0141307080
- *Tell Me How Fast It Goes (Whiz Kids)*
  , by Shirley Willis; ISBN 0531159760
- *Feel the Wind*
  , by Arthur Dorros; ISBN 00644450953
- *The Berenstain Bear's Science Fair*
  , by Stan and Jan Berenstain; ISBN 0394866037
- *Gizmos and Gadgets (Creating Science Contraptions that Work and Knowing Why)*
  , by Jill Frankel Hauser; ISBN 1885593260
- *Forces*
  , by Graham Peacock; ISBN 1568471920

*Video*

- *Lift-Off to Learning*
  , Newton in Space, NASA, 13:00

*Laser disc*

- *Windows on Science, Primary Vol. 3*
  , Force and Motion, Lessons 6-10, 14-17

## Background for Teachers

Force causes changes in the speed or direction of the motion of an object. The greater the force placed on an object, the greater the change in motion. The more massive an object is, the less effect a given force will have upon the motion of the object. Therefore, the greater the mass of an object, the greater the force needed to change its motion.

## Intended Learning Outcomes

1. Use Science Process and Thinking Skills
2. Manifest Scientific Attitudes and Interests

3. Understand Science Concepts and Principles
4. Communicate Effectively Using Science Language and Reasoning

Instructional Procedures

Invitation to Learn

Wind Wheel

Have students create Wind Wheels (pdf) using this pattern.
Blow on the wind wheel gently.
Blow on the wind wheel with a lot of force.
Have the students observe, analyze, and discuss what is happening, and why.

Instructional Procedures

Marshmallow Launcher

*Question:* I wonder if there is a correlation between one's lung capacity and the distance s/he can propel a marshmallow with the PVC marshmallow launcher.

*Hypothesis:* The greater one's lung capacity, then the greater distance one can propel a marshmallow with the PVC marshmallow launcher.

*Experiment:*

Have each student measure his/her lung capacity using a peak flow meter and record his/her individual results on the *Marshmallow Launcher* data recording sheet.
Have each student propel a marshmallow, using the PVC Marshmallow Launcher and measure and record his/her individual results.
Graph the results for each student onto the *Classroom Grid*. (For accuracy, have each student repeat both measurements three times and then calculate his/her average measurement.)

*Analyze the results:* What do the results show?

*Conclusion:* Was my hypothesis correct or incorrect?

*Further Research:* Where do I go from here?

Skimmer Kit--World in Motion

See Building the Skimmer Hull (pdf) for directions.

Extensions

Art—Blown Pictures

Put droplets of paint on sheet of paper. Use a straw to blow air (force), moving the paint into various directions and designs.

Physical Education

Use different amounts of force to hit, kick, and/or bat a ball. Observe, analyze, and discuss how the amount of force applied affects the ball.
Use a different ball than normally used in a variety of games. Observe, analyze, and discuss how the “new” ball affects the game in regards to force, motion, speed, direction, and distance (e.g., nerf sponge ball in baseball, a tennis ball in basketball, a cage ball in dodge ball, etc.).

Family Connections

Marshmallow Catapult

Read *The Gadget War* to the class. Have the students create a catapult at home with family that will launch a large marshmallow onto a designated target (such as the center circle on the gym floor from ten feet away).

Wind Wheel

Have the students share this activity and the scientific principle involved with family. Wind wheels may be constructed in school or at home.

Skimmer

Have the students design a skimmer at home with the help of family. The skimmer will move

successfully from one end of the bathtub to the opposite end of the bathtub by blowing on it or using a fan (if available).

## Assessment Plan

Marshmallow Launcher

- Did the student accurately read his/her lung capacity?
- Did the student accurately measure the distance his/her marshmallow was launched?
- Did the student correctly record the data on his/her data recording sheet?
- Did the student accurately analyze the results and draw a correct conclusion based on the data? (This could be written in students' science journals)

Skimmer Kit

- Did the student work cooperatively in groups?
- Was the student able to analyze any defect(s) in his/her design and come up with the proper solution(s)?
- Was the student able to design and construct a successful skimmer?
- The student will write about the experience in his/her science journal.

## Authors

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