

Investigation Two – Zoom Balls

Standard III Students will understand the relationship between the force applied to an object and resulting motion of the object.
Objective 1 Demonstrate how forces cause changes in speed or direction of objects.
Intended Learning Outcomes <ol style="list-style-type: none">1. Use science process and thinking skills2. Manifest scientific concepts and principles3. Understand science concepts and principles4. Communicate effectively using science and language and reasoning

**Standard
III**

**Objective
1**

Background Information

The Zoom Ball shows how the forces of push and pull work together. When partner “one” pulls the cords outward on the end, the Zoom Ball goes flying as long as partner “two” on the other end keeps the cords in by pushing. The pushing action of the cords against the opening of the bottle sets it into motion. After the Zoom Ball reaches partner “two”, he sends it back by pulling on the cords while partner “one” pushes on the cords. Notice that one partner is always doing the opposite of the other. If both partners pull, the Zoom Ball will go to the middle because of equal forces on the Zoom Ball. When both partners push, keeping the cords in, the Zoom Ball does not move. It takes opposite forces working together to make the Zoom Ball work.

Pre-Assessment/Invitation to Learn

Tell the students that sometimes when using a simple tool or doing an activity, both forces of push and pull need to be used at the same time. Brainstorm with the students which simple tools use both forces. (Ex: clippers, broom, saw, shovel, rake, hammer, etc.) Brainstorm with the students which activities require push and pull. (Ex. Throwing/catching a ball, dribbling, jacks, hopscotch, jungle-gym, jumping etc.) After brainstorming, ask the students why both forces are needed for the activities mentioned. Sometimes the opposite forces are needed to make a tool work properly.

Instructional Procedure

Materials

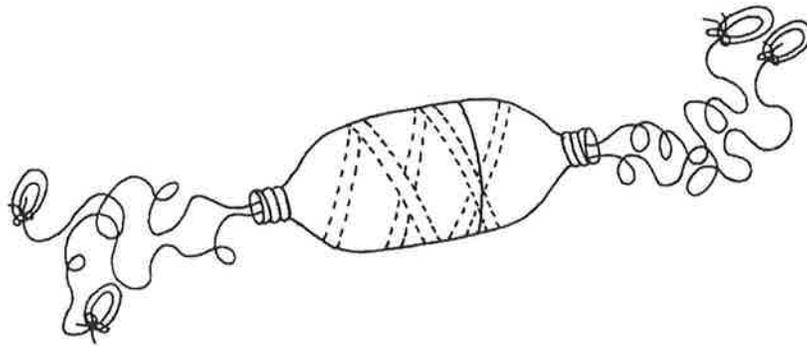
- 2 – 2-Liter plastic soda bottles (per pair)
- 2 Plastic six-pack soda can holders (per pair)
- 2 8' lengths of cord (per pair)
- Decorating materials (if desired)
- Scissors or box cutters

Preparation

1. Cut the bottoms off of the soda bottles. (Any size works.)
2. Push the bottles together, end-to-end, so they form a football shape.
3. Decorate if desired.
4. Thread the two cords through the necks.
5. Cut the six-pack holder rings apart to form four two-loop handles
6. Tie a set of handles to the end of each cord.

Activity

1. Divide the students into pairs. Give each pair a Zoom Ball. Each player holds onto the two handles and moves away from the other player until the strings are tight. Slide the Zoom Ball to one end. If you are the player closest to the Zoom Ball, pull your hands apart to send the Zoom Ball to your friends. To receive the Zoom Ball, keep your hands together.
2. Observe what happens to the Zoom Ball.
3. Discuss your observations



When you pull the strings outward, the Zoom Ball goes flying. The pushing action of the strings against the opening of the bottle, sets it in motion. When the Zoom Ball reaches the other end of the strings, an opposite pushing action (your friend's pulling motion) stops the ball for a moment and then sends it flying in the reverse direction.

Curriculum Extensions

Math –

- Compare the relationship (“<”, “>” and “=”) between the number of successful passes of the Zoom Ball between the same partners on two attempts. (*Standard 1, Objective 2*)
- Compare the relationship (“<”, “>” and “=”) between the number of successful passes of the Zoom Ball between two different sets of partners with one attempt per set. (*Standard 1, Objective 2*)

Healthy Life Styles

- Divide the students into partners. Assign one student in each group as “push” and the other as “pull”. Have the students spread out. The teacher will name an exercise. Students will be given 30 seconds, the student that represents that force will demonstrate the exercise. If it is an exercise that requires both a push and a pull, both students will participate. (Possible exercises: push-up, curl-up, wheelbarrow, frog leap, jumping jack, wind mill, arm circles, toe touches, etc.) (*Standard VI, Objective 4*)

Assessment Suggestion

- In their journals, have the students label a page “A force can be a push, a pull, or both.” Then, instruct the students to illustrate and label the different kinds of forces being used:
 1. A pulling force
 2. A pushing force
 3. A pushing and a pulling force

Resources

Books:

- *Awesome Experiments in Force and Motion*, Michael DiSpezio, Sterling Publishing Co., Inc. ISBN 0-8069-9821-0
- *Forces*, Karen Bryant Mole, Rigby Interactive Library, 1997. ISBN 1-57572-108-2
- *Forces and Motion*, Harcourt School Publishers, 2002. ISBN 0-15-322921-7
- *Forces and Motion*, Teacher Created Materials, Inc. 2001 ISBN 1-55734-625-9
- *Magic School Bus Plays Ball*, Scholastic Inc. 1997 ISBN 0-590-92240-8
- *Push and Pull*, by Patricia J. Murphy (Scholastic Library Publishing)
- *Pushing and Pulling (Science for Fun)*, by Gary Gibson (Cooper Beach Books)

Laser Discs:

- Windows on Science, Primary Vol. 3, Force and Motion Lessons 1-3, 5, 9-13
- Windows on Science, Primary Vol. 3, Simple Machines Lessons 4-10
- Windows on Science, Primary Vol. 3, Work and Machines Lesson 1-3

Videos: (Available from Jordan School District)

- *Forces: The Law of Motion* (Disney, Bill Nye) #13027 26 min.
- *Motion and Force: Play Ball* (321 Contact) #10972 15 min.
- *Force and Motion: Newton's Three Laws* #07351 18 min.

Web sites:

- <http://www.enc.org/weblinks/science/0.1578.1%2DForces.00shtm>
- <http://www.enc.org/weblinks/science/0.1578.1%2DMotion.00shtm>
- www.spacelink.nasa.gov/Instructions/ Materials/

Homework & Family Connections

Have the children make the Zoom Ball at home by sending home instructions. They are to tell their families what makes the Zoom Ball work.