

## SIEMENS STEM DAY ACTIVITY

# MOVE IT!

### REAL-WORLD SCIENCE TOPICS

- A comparison of the movements of objects
- An evaluation of the relationship between movement and force

### ADDRESSES NGSS

### LEVEL OF DIFFICULTY

1

### GRADE RANGE

3–5

### OVERVIEW

In this activity, students will investigate different ways to move a ball. Students will start with a large list of movements and work together to categorize them. Next, they will use claim and evidence statements to help them organize each category of movement and review and revise their groupings as needed. Students will use the term *force* to explain how they moved the ball in different ways.

### TOPIC

Motion and Stability

### OBJECTIVE

After completing this activity, students should be able to plan and conduct an investigation to provide evidence that changing in an object's motion requires force.

## NGSS THREE-DIMENSIONS

Science and Engineering Practices	Disciplinary Core Idea	Crosscutting Concepts
<p><b>Planning and Carrying Out Investigations</b></p> <p>Make observations (first hand or from media) to construct an evidence based account for natural phenomena.</p>	<p><b>PS2.A: Forces and Motion</b></p> <p>All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.</p>	<p><b>Patterns</b></p> <p>Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.</p>

## BACKGROUND INFORMATION

### How do objects move?

An object moves as a result of force or energy acting upon it. Movement does not happen unless there is application of energy.

### Why do objects move?

Energy is stored in our world and converted from one form into another. This energy can act upon an object, causing it to move.

### What is the relationship between force and movement?

A force is a push or pull between two objects. Whenever contact is observed between two objects, some force is between them. Sometimes we cannot see the force acting on an object. For example, when forces of nature such as gravity, electric, and magnetic forces act, we cannot see the contact between the objects.

## KEY VOCABULARY

**Force:** A push or pull on an object resulting from the object's interaction with another object

**Movement:** The act or process of moving or changing place or position

**Claim:** To say something is true

**Evidence:** Basis for belief or disbelief

## MATERIALS NEEDED FOR ACTIVITY

- Chart paper
- Assorted sports balls (e.g., tennis ball, basketball, volleyball, soccer ball, bouncy ball, ping pong, dodge ball, football, juggling, golf ball)
- Template for Claim/Evidence Statements handout

## DISCOVERY EDUCATION VIDEO RESOURCES

- Things Moving
- Force

## WEB RESOURCES

Note: Always preview websites before using with students.

<http://www.kidsdiscover.com/spotlight/force-motion-kids/>

Describes force and movement with examples

[http://www.physics4kids.com/files/motion\\_intro.html](http://www.physics4kids.com/files/motion_intro.html)

Explains the basics of the physics of force and motion in kid-friendly language

[http://idahoptv.org/dialogue4kids/season12/force\\_and\\_motion/facts.cfm](http://idahoptv.org/dialogue4kids/season12/force_and_motion/facts.cfm)

Explains the different types of force that can be applied to an object

## TEACHER PREPARATION

Have all materials ready to use.

- 1. Warm-up Activity:** Invite students to play with a variety of sports balls for five minutes of free play. Then, organize students into groups and explain that they will have thirty seconds to play with each kind of ball until they have experienced each and experimented with the ways each ball moves.  
  
Note: Consider the best strategy for small group management given your students and classroom space. Student groups can stand in one place and let the balls rotate or the balls can stay in one place and students can rotate.
- 2.** Lead a discussion with students about their first impressions. Ask questions to guide their thinking around the movement of the balls, such as the following:
  - *Did all of the sports balls move in the same way?*
  - *Could all of the sports balls do everything the others could?*
  - *What kinds of similarities and differences did you see?*
- 3.** Organize students into groups of three. Each group will investigate force and movement with one type of sports ball. Explain to students that they are to work together to experiment with ways to move the ball, listing their movements on chart paper. Circulate around to different groups and prompt them to consider movements that might not be intuitive with certain equipment, such as rolling, sliding, or blowing. Most students will push, kick, drop, or throw the sports balls.
- 4.** Next, ask students to categorize the movements on their lists. Allow students time to brainstorm their categories on their own and begin sorting. Students might sort them by movements using their feet versus hands or they might consider movements along the ground or in the air.
- 5.** Next, ask students to support their categories by stating a claim and providing evidence for each one. For example, their claim might be *A ball can bounce*. The evidence might be *According to my observations a ball can be dropped or thrown against something and will bounce and come back*. A template is provided

to help students capture their thinking.

6. Ask each group of students to share one claim and evidence statement with the whole group.
7. After each group has shared a claim and evidence statement, ask students to revisit their categories and see if they can categorize them into push or pull movements. Depending on the types of sports balls they had, they might have both movements. However, students should generally observe they are push movements.
8. Next, introduce the term *force*. Explain to students that a force is a push or pull between two objects. Whenever contact is observed between two objects, some kind of force is acting on them to move them toward each other. Have students view “Things Moving” and “Force” videos to build understanding of the relationship between movement and forces. Pause the video as needed to discuss concepts with students.
9. Ask students to consider the different forces that moved their group’s ball from one place to another. It is anticipated students will share they moved the ball or another object or surface interacted with the ball to move it.
10. Finally, ask students to do the following:
  - Summarize in two sentences how your sports balls moved. Be sure to use the term *force*.
  - How did different types of forces move your ball differently?
  - What would happen if you did not apply any force to the ball?
  - What did you learn about force and movement in this activity?

## EXTENSION ACTIVITY

Introduce a ball game that might not be as common to students such as cricket, croquet, handball, or tetherball. Ask students to review videos on the game in action or practice the game as small groups. Then, as a group, discuss what forces were moving the ball in the different games. Ask students to explain how different types of forces moved the ball differently.

## SOURCES

[http://hep.physics.indiana.edu/~rickv/force\\_and\\_motion.html](http://hep.physics.indiana.edu/~rickv/force_and_motion.html)

Question: What makes a sports ball move from one place to another?	
Claim:	
Evidence:	Evidence: