

1st GRADE

FORCES – PUSH AND PULL

Summary: Students learn that every force is either a push or a pull. They push and pull objects in the classroom. Students use a rubber ball to demonstrate motion words such as: straight, zigzag, curved, back-and-forth etc. Raising a ramp a ball is rolled down from demonstrates the principle that increasing force increases the distance an object moves.

Intended Learning Outcomes for 1st Grade:

Objective 1: Framing questions. Conducting investigations. Collecting data. Drawing conclusions.

Objective 2: Developing social interaction skills with peers. Sharing ideas with peers. Connecting ideas with reasons.

Objective 3: Ideas are supported by reasons.

Utah State Core Curriculum Tie:

Standard 3 Objective 1: Physical Science

Describe, classify, and communicate observations about the motion of objects, e.g., straight, zigzag, circular, curved, back-and-forth, and fast or slow.

Compare and contrast the movement of objects using drawings, graphs and numbers.

Explain how a push or pull can affect how an object moves.

Preparation time: 40 min

Lesson time: 50 min

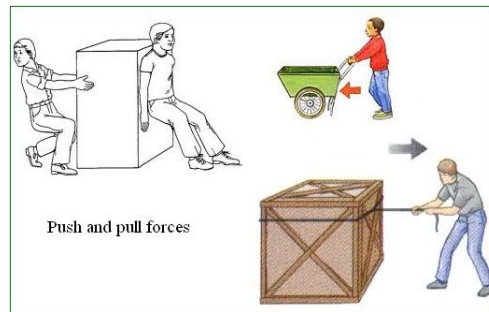
Small group size: works best with one adult for every 5 students

Materials:

1. Push and pull objects: pictures of push and pull objects, toy trains or cars, blocks, jar, pencil, yo-yo, magnets
2. Change in motion objects: rubber balls, roll of masking tape, yarn
3. Increasing force objects: rubber balls, 2-foot wooden ramp or side of a box or board, 4 blocks for each group, small pieces of paper

Background information:

The movement of objects is caused by a force that is either a push or a pull. When an object moves there is an interaction between two objects resulting in a force. How an object moves by one of these forces depends on a number of factors: size, weight, shape, and the degree of friction. When an object moves it can move along different paths. Words we use to describe this movement can be demonstrated in the lab using a rubber ball.



Increasing the force on an object can increase its movement. When a ball is released down a ramp from increasing heights, the force on the ball increases. The larger the force on the ball, the farther it will move.

Pre-lab discussion: Show students a basketball and ask how they make it move. Wait for a student to say it needs to be pushed. Discuss with the students the push from your arm, which moves the ball towards a basket. Ask the students to act out several other movements: raise your hand, lower your hand, clap your hands, and push your seat back. Explain to the students that all movements are either a push or pull and that is what they will be exploring today.

Instructional procedure:

1. Exploring the force of push and pull - Explore the different objects in the pan and have kids take turns pushing or pulling them. Make sure they are saying the words push and pull correctly each time. Show them that the force of pushing and pulling performs work that we need to get done. Also, perform the following activities around the classroom.

- a. Pull a cabinet door open and push it closed.
- b. Push the water faucet on and pull it off.
- c. Push the door open and pull it closed.
- d. Pull open a box lid and push it back on.
- e. Push a chair away from you and pull it towards you.
- f. Push the air out of your mouth and pull it back in.
- g. Draw a capital letter M on a piece of paper. Identify the push and the pull.
- h. Pull open the window and push it closed.

- i. Have students sort the push and pull pictures onto the papers marked push, pull, or push and pull.

2. Exploring how forces can change the motion of an object – Use the rubber ball to demonstrate the following motion paths an object can take. For each motion describe if it needed a push or pull. Have the students repeat the words that describe the type of motion as the motion is occurring and talk about how kids use these motions on a playground.

- a. Straight – Push the ball straight from one student to another. (Ball in kickball)
- b. Back and Forth – Have the second student push the ball back and continue to show back and forth. (Swing moving back and forth)
- c. Zigzag – Have students roll the ball from one to another across the table in a zigzag motion. (Playing tag to avoid being tagged)
- d. Circular – Put the ball inside the roll of tape to roll the ball in a circular motion. (Tetherball)
- e. Curved – Make the yarn into a curved shape. Gently push the ball along the yarn so it forms a curved motion. (Swing as it moves it forms a curve)
- f. Fast – Use a big push to make the ball go fast. (Run hard)
- g. Slow – Use a small push to make the ball go slow. (Walking on the playground)
- h. Bounce – Lightly bounce the ball across the table. (4 square)
- i. Starting a motion – Put the ball in the center of the table and ask what needs to be done to the ball to get it to move. A push or pull must be applied. Objects don't move on their own they must have a force put on them. (Kicking the ball in kickball)
- j. Stopping a motion – Start the ball rolling and ask how it can be stopped. Explain that a ball will roll until a force stops it from rolling. (Catching a ball)

3. Exploring how increasing force can increase the distance an object moves

- We will raise a ramp that a ball is let go on and mark how the distance the ball moves changes with each ramp level. Make predictions before each ball is rolled.

- a. Let the ball go down a ramp with no blocks underneath. Put a small piece of paper where the ball stopped. It's best to do this experiment on carpet or the ball rolls too far. Ask the students why that would be the case.

- b. Put one ramp under the ramp and let the ball go again. Put a second piece of paper where this ball stopped.
- c. Put a second, third and fourth block under the ramp and repeat the markings.
- d. Discuss how increasing the ramp height, increased the force the ball rolled from and how that increased the distance the ball went.