

# Using Force and Motion

## Summary

This is a hands on investigation that demonstrates what happens when a force is applied to an object.

## Time Frame

1 class periods of 45 minutes each

## Group Size

Small Groups

## Materials

Per group of four:

2 L plastic bottle

water

rope

yardstick

shoe boxes or other boxes of similar size

## Background for Teachers

Students will understand the relationship between forces applied on a variety of objects and the motion that results from the applied forces. Students will construct simple machines to move a bottle.

## Student Prior Knowledge

Students need to have been presented with basic principles of force and motion.

## Intended Learning Outcomes

1. Observe objects and patterns and report observations.
2. Pose questions about objects, events and processes.
3. Explain science concepts and principles using own words and explanations.

## Instructional Procedures

Each group of four should be assigned a specific job: runner, reporter, recorder, and timekeeper.

Step 1. Pass out supplies to each group's runner. Have each runner fill the 2 L bottle halfway with water.

Step 2. Explain to the students that their challenge is to create a simple machine that will move the water bottle at least 12 inches. Students are not allowed to directly touch the bottle when moving it. They may use the rope, the yardstick and blocks to accomplish the task. Have them come up with as many possible solutions as they can in 30 minutes.

Step 3. The timekeeper should keep the group moving and aware of the time. The recorder should record the group's observations and write down any problems that were encountered. The recorder should also record any solutions that the group comes up with. Each group should draw pictures of their solutions.

Step 4. As the group works together, have them consider some questions that you post on the board:

Does your machine move the water bottle successfully 12 inches?

Could you change the speed or direction of the water bottle with your machine?

What kinds of forces did your group use to accomplish the task?

Did anything unusual or unique occur that you can share with the group?

Step 5. At the end of the time, have the class come together as a whole group. Allow each group's reporter to share their machines and results with the class.

Step 6. Ask students to form conclusions that they could state from these activities. Did they discover that they could use a pulley or a lever (simple machines) to lift the bottle? Did anyone create something more complex? Have students record their experiments and observations in their science journals.

Step 7: In their science journals, ask students to explain why objects at rest will not move unless a force is applied to them. Ask them to compare the forces of pushing and pulling.

### Extensions

Challenge students to repeat the experiment and find out how high they can lift their bottle.

Have them fill the bottle with different amounts of water and repeat the experiment. Does the amount of water used affect the results they measure?

### Assessment Plan

Assess student journals and look for observations and explanations of how the bottle was moved.

Instruct students to show that objects at rest will not move unless a force is applied to them.

Instruct students to compare the forces of pushing and pulling.

### Bibliography

Original lesson plan submitted by Kimberly Johnson

### Authors

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