Push or Pull?

Grade K: Force Probe

Aligned with National Standards

ward's science
Single Probes

overview

Students use forces constantly in their day-to-day lives. A force is simply a push or a pull on an object. In this activity students will use the WARD'S Single Force Probe to collect data pertaining to the push and pull of an object across a flat surface. They will also use a ramp to experience how it changes the amount of force an object requires to be moved/lifted.

This activity using one of WARD'S Single Probes to collect data, allowing students to focus on the scientific discovery and allowing more time to be spent on learning and developing higher levels of thinking in your students.

time requirement:

This activity can be completed in one session of 20 minutes.

materials required for the activity:

1 WARD'S Single Force Probe
1 block of wood with hook attachment (A shoe will work as well)
Weights or heavy objects to place on the block of wood

Instructions (this booklet): Teacher's Guide and Student worksheet if needed.

safety precautions

general safety:

- Remind students to read all instructions before starting the lab activities, and to ask questions about safety and safe laboratory procedures. For the early grades that may not be proficient in reading yet, review the safety and lab procedures together with your students.
- Consider establishing a safety contract that students and their parents must read and sign. This is a good way to identify students with allergies (e.x. latex) so that you (and they) will be reminded of specific lab materials that may pose risks to individuals.
- Discuss safety concerns and appropriate behavior expectations with students prior to each science activity
- Make any necessary individual student modifications.
- Limit size of student working groups to a number that can safety perform the activity without causing confusion and accidents.

framework for K-12 science education © 2012

DIMENSION 1 Science and Engineering Practices

	Asking questions (for science) and defining problems (for engineering)		Use mathematics and computational thinking
	Developing and using models		Constructing explanations (for science) and designing solutions (for engineering)
×	Planning and carrying out investigations		Engaging in argument from evidence
×	Analyzing and interpreting data	×	Obtaining, evaluating, and communicating information

DIMENSION 2 Cross Cutting Concepts

×	Patterns		Energy and matter: Flows, cycles, and conservation
×	Cause and effect: Mechanism and explanation	×	Structure and function
×	Scale, proportion, and quantity		Stability and change
	Systems and system models		

DIMENSION 3 Core Concepts

Discipline	Core Idea Focus
Physical Sciences	PS2: Motion and Stability: Forces and Interactions

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NGSS STANDARDS

Elementary School Standards Covered
K-PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.

national science education standards © 1996

Content Standards (K-12)			
	Systems, order, and organization		Evolution and equilibrium
×	Evidence, models, and explanation	×	Form and Function
×	Constancy, change, and measurement		

Life Science Standards Elementary School	
×	Position and motion of Objects

× Indicates standards covered in activity

prior to class

- Go over the general use of the force probe.
- Make copies of worksheets/pictures if desired.
- Set up the materials needed for each group

objective

Students will observe and participate in an experiment in order to show that there is a number associated with the pushing and pulling of an object and this number is equal to the force on the object.

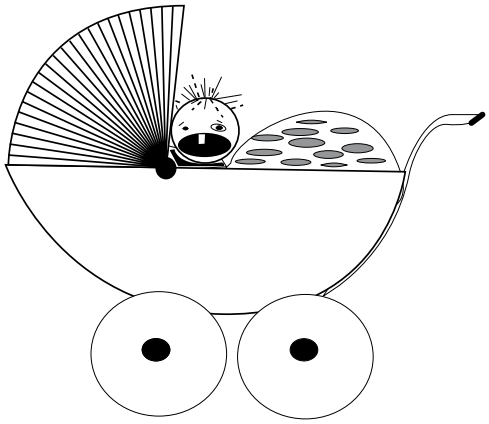
background

Force and motion are fundamental to all matter in the universe. A force is anything that can push or pull an object. Forces and motion are integral parts of our daily lives. From kicking a soccer ball, to picking up a sandwich, to dropping a pencil, force and motion are always at play. Even the blood flowing through our bodies moves due to the pumping force of the heart muscle.

build upon prior knowledge:

- Ask students to look at a series of pictures and determine if they require a push and pull. *(Student responses should be 1: push, 2: pull, 3:pull, 4: push, 5: push, 6: pull)*

1



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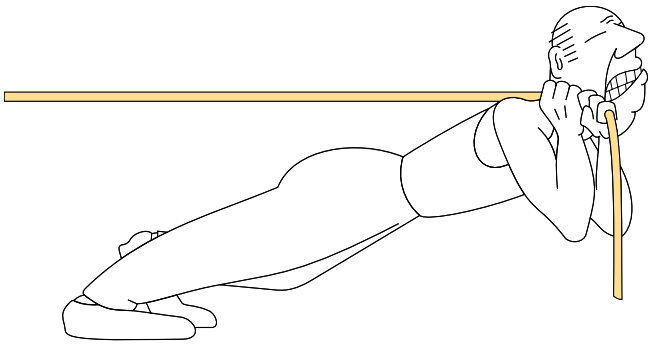

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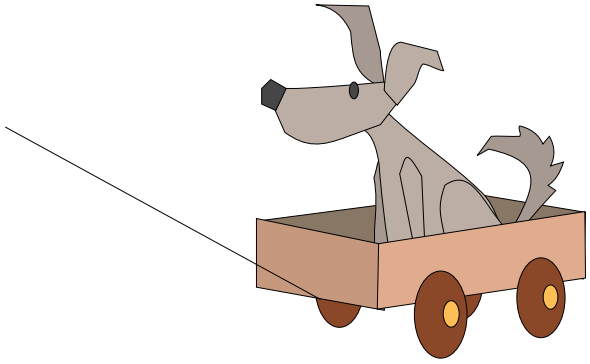

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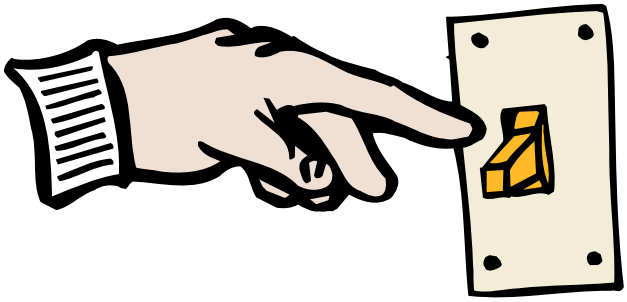

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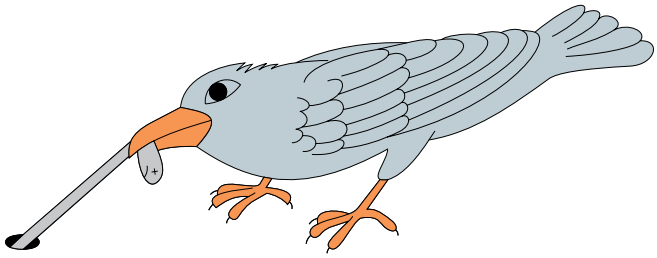

- Ask the students to make up their own examples.

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guiding questions

- What do you think will happen? (Hypothesis)
- What do you expect to learn?
- What tools are needed?
- How can we record our findings?

procedure

Using the WARD'S Single Force Probe, explain to students that the motion of either pushing or pulling has a number associated with it, which relates to the force of that motion. A small push or pull will result in a small number on the WARD'S force probe, while a big push or pull will result in a bigger number.

1. Attach the WARD'S Single force probe to a wooden block.

2. Have students take turns pulling the wooden block across a flat surface. Observe the number on the force probe. Record the average force for each student . See Figure 1.

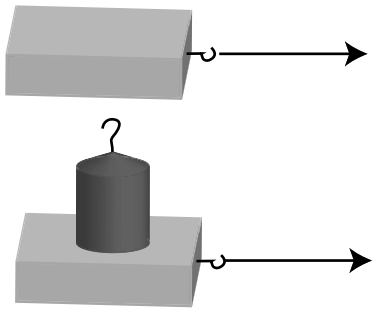

Figure 1

3. Now, place another wooden block or weight on top of the first block. Have students observe that the block is now heavier and will require a bigger pulling force (more muscles) to pull the block across the flat surface.

4. Help students track the difference in force that is displayed on the probe by either writing it on a white board or graphing it.

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5. Ask the students to repeat the two experiments but now have them push the block from behind. Record the value of force for each instance. See Figure 2.

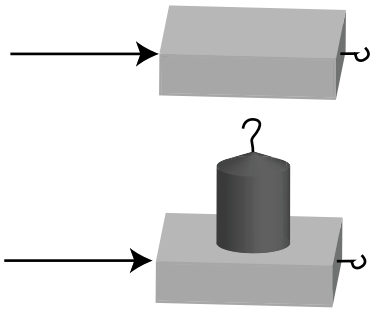

Figure 2

summarize

Ask students how adding more weight to a block affected the force needed to move it. (*Student responses may include: The heavy the block the more force that is required to move it.)*

extension

Students pick up their backpack every day and put it on their back. They know that it takes muscles to lift it up. Have they ever tried to figure out an easier way to lift it up? How about using a ramp? Show students that if they lift the backpack straight off of the floor, it requires a certain amount of force, BUT if they pull their backpack up a ramp in order to reach the same height, it will take less force. This can be done using the car once again and incorporating a ramp.

note

teacher notes

- Review basic information about how to use the Single Force probe. Make sure the probes are calibrated to "zero" by pressing the balance icon on the unit icon (N or g) on the face of the screen and then press the balance icon.

- If you wish to change the value in which the force probe registers a positive or negative, press the same unit icon as above, then choose:

 pulling is negative

 pulling is positive

Worksheet

Name: _____

Pulling

1. Force required to pull the block only: _____ N

2. Force required to pull the block and the added weight : _____N

Pushing

3. Force required to pull the block only: _____ N

4. Force required to pull the block and the added weight : _____N

Summary:

How does a push on an object compare to a pull on the same object?

_____

_____

_____

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