Newton’s Third Law action-reaction
4th Grade
Daniel F. Fink, Lashonda Orrell and Lila Levendoski

References:

- 2003-04 Columbus Public Schools Science SLC Guide

Benchmarks:

SLC 12: A.) Students will apply concepts of Newton’s Laws in scientific explorations.
B.) Students will explore the relationships among force, mass, direction and speed on moving objects

Objectives:

To help students test and identify the characteristics of objects that makes them easier or harder to push, in the process discovering Newton’s 3rd and 2nd Laws: heavy objects are harder to push than light objects.

Materials:

- Buckets of water with handles
- Mop and paper towels
- Skateboards or rolling carts

Initial Demonstration:

Have students stand up straight. Ask them to start leaning over until they start to fall. Now have them put their hands on a wall and keep moving their legs backwards away from the wall. Ask them how come they are able to lean further over w/o falling?

Target Observations:

- If you lean to far over, gravity will cause you to fall.
- If you lean on something, or if something pulls or pushes on you, you will not fall.

Target Model:

- Gravity pulls down on you all the time.
- You can apply a force to balance out gravity so that you will not fall over.
**Procedure:**

At each step of the procedure have the students record a prediction for what they think is going to happen.

1. Have the students stand on a rolling cart/skateboard by a wall. Now have them push away from the wall and observe what happens.

2. Now have them stand on the cart and have another student push *gently* on them and observe what happens.

3. Now have the pushing and the pushed student stand on a cart at the same time and observe what happens.

   When you pushed against the wall, the cart moved. When you were pushed by your friend, you moved and they did not [or did they?? Repeat with a small person pushing a pig person and watch their shoulders move backwards]. When you both were on a cart, both moved… why? Whenever a contact force is applied to an object, there is an equal force applied right back.

   This can be stated as Newton’s 3\textsuperscript{rd} Law of Motion

   3. For every action there is an equal and opposite reaction

   [If *all objects have gravity* has not yet been discussed this is a good time to do it, ask why if there is law 3, why does Earth not fall towards us? The answer is that it does, only the force is insignificant, also, the action-reaction rule is only for contact forces.]

**Target Observations:**

- The student in the cart moved away from the wall when they pushed it.
- The student in the cart moved away from the student who pushed them.
- The students in the cart moved away from each other, but the cart stayed in the same place on the floor.

**Target Revised Model:**

- For every push, there is a push in the opposite direction.
- For every pull, there is a pull in the opposite direction.
- This is Newton’s Third Law of Motion.

**Summary:**

Students have learned about Newton’s Third Law of Motion, and should be familiar with its basic premise of action-reaction. For every push/pull, there is a push/pull in the opposite direction.