

## Identifying Common Forces, Part 2

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Big Idea for Physical Education		Big Idea for Science	
Movement Competency		Forces and Changes in Motion	
Standards			
<p><b>PE.5.M.1.4:</b> Strike moving and/or stationary objects with long-handled implements so the objects travel in the intended direction at the desired height using correct technique.</p> <p><b>SC.5.P.13.1:</b> Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.</p>			
Learning Goal for integrated lesson plan			
<p>The student will</p> <ul style="list-style-type: none"> <li>● use newly gained information to practice Nature of Science skills through data collection in the PE class.</li> </ul>			
Vocabulary common to both disciplines			
<ul style="list-style-type: none"> <li>● force</li> <li>● push</li> <li>● pull</li> <li>● gravity</li> <li>● friction</li> </ul>		<ul style="list-style-type: none"> <li>● stationary</li> <li>● catch</li> <li>● throw</li> <li>● defend</li> <li>● strike</li> </ul>	
Teacher Notes			
<p>This lesson was created as an “Elaborate” in the 5E Model. It is intended to be used after <b><i>Identifying Common Forces, Part 1.</i></b></p>			
Summary of Physical Education Activity		Summary of Science Investigation	
<p>Students will continue their science investigation in PE using Striking and Fielding stations. Students will collect their data as they move through the stations and will analyze and conclude in science class.</p>		<p>Students will design an investigation in science class, then they will carry out their investigation in PE class. Once data is collected during PE, they will analyze and conclude in science class.</p>	
Integrated Assessment			
Conclusion and data analysis from integrated lessons			

## Physical Education: Forces in Action

### Duration of Lesson

One class period (45 minutes)

### Materials/Setup

#### Materials:

- wiffle bats
- pool noodles
- rackets
- PVC pipes
- measuring tape
- cones and or baseball/softball T's
- popsicle sticks

#### Setup:

Station 1 - Strike with a wiffle bat

Station 2 - Strike using a noodle

Station 3 - Strike using a racket

Station 4 - Strike with your hand

Station 5 - Strike with PVC pipe

- Each station will have a tee and/or cones set up, a ball, a long handled implement and measuring tape.
- Materials for science data collection should come with the student.
- Allot enough space in between for students to swing their long handled implement.
- In the event of limited measuring tape, use popsicle sticks at the landing point and continue to measure from that point.

### Teacher Notes

#### **Pre-Instruction:** Whole group

Discuss with students what they learned in science class. Assign students into groups and assign them to a station. Review the stations prior to releasing students from whole group. Students will explore and investigate striking a ball off a tee (or large cone) using different long handled implements.

### Safety

Allot enough space in between for students to swing their long handled implement, and manage how the students will retrieve their balls without getting hit by other balls. Remind students not to walk behind someone who is swinging an implement. Students swinging implements should not do so while others are within close range.

### Procedure

#### **Instruction and Engagement:**

Today you will be in stations with different long handled implements. You will take what was introduced to you in science class and conduct your investigation here in PE today. Remember to record (document/write down) your observations and details of your trials.

The class will be divided into groups of 4-5 students.

Each group member will have a roll during the activity.

**Essential Questions:**

- *Did the different implements in each station change the distance of the ball when used to hit the ball off the tee/cone?*
- *What forces were acting on your ball?*
- *Did you use the same force to hit the ball with the different implements?*

**Procedure:**

1. Player 1 will step up to the tee/cone.
2. Player 2 will have the measuring tape ready in their hands.
3. After Player 1 swings the implement, Player 2 will set and hold down the measuring tape even with the cone.
4. Player 4 will hold the other end of the tape measure.
5. Player 1 will record data.
6. Player 3 will retrieve the ball and bring it back the group.
7. Player 5 (if any) will actively engage in the 5 circuit workout (10 jumping jacks, 10 high knees, 10 up downs, 10 squat jumps, 10 pushups. Player 5 will continue until time to rotate.
8. Players rotate their roles after the first player records their data and the ball, measuring tape and science materials are all set for the next player.

**Closing Activity:** Bring students back to whole group. Pose the question- Which long handled implement was used when the ball traveled the farthest distance?

**Differentiated Instruction:** Use lower cones, shorter implements, modify the swing of the implement, create a competitive measurement goal for students to hit.

## ***Science Investigation: Investigating Forces***

**Duration of Lesson**

Two 30-minute science periods

**Materials**

- Student Interactive Notebooks
- Forces Observation Student Sheet - 1 per student (attached)
- pencils
- colored pencils
- graph paper for each student
- meter sticks or other measurement device

**Teacher Notes**

This lesson requires students to have experience with grade 5 Nature of Science standard SC.5.N.1.1.

**Safety**

During PE class, students will need to make sure they are not out measuring distance while others are hitting their balls off of the T. The stations will need to be spread out so that students are not hit by the balls.

## Procedure

### **Science period 1 (30 min)**

1. Discuss with students about how they might design an investigation to determine “How the implement used to strike the ball will affect the distance the ball travels?” Allow students to work in teams of four and challenge them to come up with two ways to test the question.
2. Guide students to test implements made of different materials being hit from a T with the same force applied each time a ball is hit.
3. After the procedure is decided, students will need write their procedure for carrying out their investigation.
4. Create a data table in their notebooks (see attached). Depending on time, you can have students create their own table, or use the one attached.

### **Science period 2 (30 Min)**

Once data is collected, students will analyze the data to answer their question. Emphasis should be placed on the need for repeated trials to make sure data is reliable. Differences in data should be discussed, allowing students to brainstorm reasons for those differences. The attached data table has space for students to find the average across trials before answering their question.

## Forces Observation Student Sheet

Implement Used	Distance

**Testable Question:**

**Conclusion:**

