



8th Grade: I Like to Move it (Move it)

Course description: Isaac Newton observed forces and motion through an apple falling on his head, but students will observe forces and motion through interesting experiments and demonstrations. Students will be introduced to each of Newton's three laws of motion and get an opportunity to see these forces in action as they race their own water bottle cars.

Day 1: Students will begin with a basic overview of forces and motion and a general introduction to Newton's Laws of Motion. We will introduce the idea of gravity and then potential and kinetic energy by doing ball drop experiments that the students must make predictions about before releasing.

Demonstration: To understand the basics of potential and kinetic energy, students will get to go outside and test out bouncing different-sized bouncy balls. We will discuss how different sized balls experience different forces and then formulate hypotheses about how each ball's bounce will compare to the others.

Day 2: Building on the concepts explored on the first day of this lesson, students will focus on Newton's Second Law of Motion (Law of Mass and Acceleration). It may seem obvious that objects move in the direction that they are pushed but this will help reinforce the reason for why Newton's Laws are so important: they are simple and *simply* foundational.

Demonstration: In order to understand how Newton's second law functions, students will be creating their own catapults in small groups. Prior to the lab, we will formulate a hypothesis as a class and see if the data we collect from our catapults will support our predictions. Students will use three different sized projectiles (of equal density) in order to demonstrate that changes in mass will impact the trajectory of an object. After conducting this mini lab, students will discuss what other factors they think would change the distance their catapult was able to throw objects.

Day 3: Students will be creating their own water bottle cars and racing them down a ramp to visualize how forces act on objects. Data will be collected on each car's speed and then the cars will be saved so they can be used again in the next lesson.

Demonstration: Using a water bottle, pencils, and some bottle caps, students will construct their very own car to understand how forces work. For this lesson, students will be rolling their cars down a hill. During this lesson, they will discuss how the potential energy stored in the car at the top of the ramp is converted to kinetic energy as it travels down the track. Each student will have an opportunity to race their cars at different track angles and notice how this can result in a faster or slower conversion between potential and kinetic energy.

Day 4: Students will spend this class making modifications to their water bottle cars and augmenting the track it goes down to increase its speed and total distance traveled. All modifications will be discussed in terms of their change of one of the factors described in our overview of Newton's Laws of Motion.



Demonstration: Students will discuss ideas for increasing the distance their car travels and then make whatever modifications they like to achieve that goal. Then students will focus on the track again and work as a group to construct a much longer version of a racetrack and make sure to include several bumps and hills. As they design and build this track, they should talk through how the potential and kinetic energy will change as the cars travel over the bumps and hills. Once students have a general idea of the track they want to construct and how it will allow for their car to travel long distances, they will be able to add a “motor” to their car. The “motor” will be a balloon and an added straw to direct the wind from the balloon.