

TABLE 2

Overview of learning progression.

<p>Getting Things Moving with Newton’s First Law: Potential energy, kinetic energy, balanced, and unbalanced forces</p>	<ul style="list-style-type: none"> • Students observed the behavior of classroom objects, then applied forces to the objects, observing movement patterns, and then redefined inertia to basic terms. • Students compared the mass of objects and the inertia of those objects, comparing a golf ball and a ping pong ball. • Students learned that the loads on a lever relate to the amount of force they must apply to make the objects move. • PhET simulations were used for students to interact with and observe multiple ways Newton’s first law applies to objects at rest and objects in motion while removing other outside forces (friction).
<p>Newton’s Second Law: Speed, Velocity, Acceleration, and Momentum</p>	<ul style="list-style-type: none"> • Students created a tape measure track and measured the time it took a ping pong ball and golf ball to roll a maximum distance of 25 feet when pushed on the floor and compared how mass affects acceleration, through calculating the speed of the object. • Students observed and compared falling objects to make connections to gravity, objects, and the forces acting on those objects.
<p>Keeping Things Moving With Newton’s Third Law of Motion</p>	<ul style="list-style-type: none"> • Students used a rubber band and weight-powered can to observe action and reaction forces. • 5-Coin Slide: Students predicted what would happen when they flicked one, two, and three coin(s) at a line of coins without any supporting structures.
<p>A Thrilling Rollercoaster Ride: Total Energy</p>	<ul style="list-style-type: none"> • Roller coaster Observations: Students observe rollercoaster designs with design flaws. The observations relate to Newton’s laws of motion and require the students to identify specific locations needing improvement. • Roller coaster Designs: Students are given one hour to collaborate and design on paper a variety of ways to build a rollercoaster using the established materials and guidelines. • Roller coaster Building: Students are given 2.5 hours to build a functioning rollercoaster using Quercetti marble coaster and classroom materials.