

## NGSS Literature Lesson Plan

<p><b>Performance Expectation(s):</b> 3-PS2-1</p> <p>Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.</p>	
<p><b>Literature Connection</b></p>	
<p><b>Literature:</b> Equal Shmequal by Virginia Kroll</p> <p><b>Benchmark Connection:</b> Unit 10: Forces and Motion. Use Short Read 2 What Makes Things Move as a follow up to this lesson. You can choose to do the experiment mentioned following the reading, but be aware that it does not directly connect with this NGSS standard.</p>	
<p><b>Student Background Information</b></p>	
<p><b>Prior Student Knowledge:</b></p> <ul style="list-style-type: none"><li>• If you push something it will move forward, backward</li><li>• Push – pull</li><li>• Balancing and math (balance beam) = balancing equations in math</li></ul> <p><b>Student Misconceptions:</b></p> <p><b>Barriers:</b></p> <ul style="list-style-type: none"><li>• Vocabulary (fixing balanced - unequal)</li></ul>	
<p><b>Engage</b></p>	
<p>If you would like to, you can begin by playing a quick game of Tug of War to provide background knowledge for the class before reading the book Equal Shmequal.</p> <p>Read the book Equal Shmequal, stopping to point out concepts like equal/balanced, unbalanced, and the motion that occurs.</p> <p>Either during or after the reading complete <a href="#">this</a> handout whole group or in small groups.</p>	<p><b>Materials/Resources</b> Large Rope (optional) Equal Shmequal <a href="#">Equal Activity</a></p>
<p><b>Explore</b></p>	
<p>We are going to take the balanced and unbalanced seesaw and Tug of War to the next level by planning an investigation of how the balance of forces affects motion.</p> <p>Begin by introducing materials students will use during this investigation (add any materials you would like to</p>	<p><b>Materials/Resources</b> Must have materials: Toy cars (different sizes/weights)</p>

<p>the optional list on the right). The materials station will be used in their own investigation and needs to be available to students to pick up items.</p> <p>Setup your whole class investigation by showing students a car with an attached string over a table. On the whiteboard or chart paper, draw the car and string as well.</p> <p>Ask students the following questions and chart their responses next to the drawing:</p> <ol style="list-style-type: none"> <li>1. Is there evidence of motion?</li> <li>2. What could we do to create motion?</li> </ol> <p>As students elicit responses to question number 2, mark arrows and text to show force and motion as well as taking notes on the side of their ideas.</p> <p>If a student says “we could pull on string” to get the car to create motion, state that we are going to do a variation of that and transition into our investigation.</p> <p>Have students break into groups of four providing each group a car and a string. Each group will design and implement three tests and complete the handout <a href="#">here</a>. Stop between each test to ensure each group understands what they are testing, and how to complete the cause and effect.</p>	<p>String Scissors Washers Tape</p> <p>Optional materials: Cardboard Wooden blocks Paper Legos</p> <p><a href="#">Car Investigation Handout</a></p>
<p><b>Explain</b></p>	
<p>Because every student had a different size or weight of car and used different variables to investigate we are going to have students participate in a Science Discourse activity to gather ideas as well as explain their investigations focusing on Test 3: How does the size of an unbalanced force affect the motion of the cart.</p> <p>Two students in each group will stay and explain their setup and investigation of Test 3 and two students will leave to investigate other groups' investigations. The two group members who are leaving should bring a notepad to record notes or drawings on what the other groups did. Ring a bell every two minutes to have people switch until they see every group. Allow the group members to return and provide time for them to share notes and discuss what they saw.</p> <p>Gather together the whole group to hold an ending discussion centered around the question: How were the investigations in the book Equal Shmequal similar to and different from your investigation? Chart whole group responses and have students end either by responding orally or journaling an independent response.</p>	<p><b>Materials/Resources</b></p> <p>Journal/Lined Paper</p>

