**Force and Motion in the Real-World**

This vocabulary-focused lesson is designed for students in grades 3-8 and for use after reading the Force and Motion book. Here, students will create definitions for vocabulary terms related to the major concepts of force and motion. They will then collaborate with peers to revise and edit their writing. Finally, students will demonstrate their understanding by independently applying what they know to a variety of real-world scenarios.

**Standards:**

**Common Core State Standards:**

* **3rd Grade**
  + **CCSS.ELA-Literacy.W.3.5** – With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.
* **4th Grade**
  + **CCSS.ELA-Literacy.W.4.5** – With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.
* **5th Grade**
  + **CCSS.ELA-Literacy.W.5.5** – With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
* **6th – 8th Grades**
  + **CCSS.ELA-Literacy.WHST.6-8.5** – With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.

**Next Generation Science Standards:**

* **3rd Grade**
  + **3-PS2-1** – Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
* **4th Grade**
  + **4-PS3-1** – Use evidence to construct an explanation relating the speed of an object to the energy of that object.
  + **4-PS3-2** – Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
  + **4-PS3-3** – Ask questions and predict outcomes about the changes in energy that occur when objects collide.
* **5th Grade**
  + **5-PS2-1** – Support an argument that the gravitational force exerted by Earth on objects is directed down.
* **Middle School**
  + **MS-PS2-1** – Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.
  + **MS-PS2-2** – Plan an investigation to provide evidence that the change in an object’s motion depends on the sum of the forces on the object and the mass of the object.
  + **MS-PS3-1** – Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

**Objectives:**

* Students will be able to define and provide examples of vocabulary terms related to force and motion.
* Students will be able to demonstrate an understanding of foundational concepts related to motion by applying what they know to a variety of real-world scenarios.

**Lesson Duration:** approximately 30-45 minutes

**Materials:**

* The Building Blocks of Physical Science series, specifically Force and Motion
* Scratch paper
* Pencils
* Force and Motion Vocabulary Terms Worksheet (1 per student)
* Force and Motion in the Real World Worksheet (1 per student)
* Force and Motion in the Real World Worksheet answer key

**Requisite Prior Knowledge:**

* Before engaging in this lesson, it would be beneficial for students to have read the Force and Motion book. Students should be familiar with the idea that force and motion work as a team. In addition, students should be familiar with the vocabulary terms highlighted in this lesson plan.
* Because this lesson involves a task in which students must revise and edit their writing, it might be beneficial to review common writing strategies related to these skills before engaging in this lesson.

**Assessments:**

* Force and Motion Vocabulary Terms Worksheet
* Force and Motion in the Real World Worksheet

**Vocabulary:**

* Acceleration – a change in the speed or direction of an object
* Distance – the amount of space between two points
* Force – a push or pull
* Friction – rubbing between objects that slows them down and produces heat
* Gravity – a force that attracts all objects toward one another
* Inertia – the tendency of objects to stay at rest or in motion
* Mass – the amount of matter in an object
* Motion – a change in position
* Speed – the distance traveled in a certain time

**Differentiation Considerations:**

* Because students will work in pairs to complete the Application Activity portion of the lesson, it is important to strategically group students based on their learning abilities and needs. Pairs should be able to collaborate in order to edit and revise their writing. If you have peer editors in your class, consider using these familiar pairs during this lesson.
* Consider pulling an enrichment group during the Application Activity to prompt and push students to extend their thinking and create the most comprehensive definitions that are still 10 words or less in length.

**Lesson and Instruction:**

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| **Lesson Components and Time Guidelines** | **Teacher Actions** |
| **Introduction/Hook**  Approximately 5-10 minutes | Begin by activating prior knowledge with a “brain dump.” During a brain dump, students are encouraged to write anything they think or wonder about related to a particular subject on a piece of scratch paper. Here, students will have 2 minutes to brain dump everything they know or wonder about force and motion. Challenge students to write the entire time. When time is up, have students share what they brain dumped with a neighbor before calling on a few volunteers to share out. Consider picking specific students and responses to address any misconceptions. Chart responses with a bullet pointed list to be used in the Direct Instruction phase of this lesson. |
| **Direct Instruction and Modeling**  Approximately 5-10 minutes | Review the bullet pointed list you created during the Hook and model how to use these concepts to create a working definition of the term motion. At this point, do not worry about the length of your definition but be as comprehensive as possible.  Next, explain to students that you will use your critical thinking skills to revise and edit that definition so it contains ten words or less. Model this process with the term motion. Use think-aloud strategies to explain how you approached your revisions as well as to review any word-saving strategies you used. |
| **Application Activity**  Approximately 15-20 minutes | Pair students strategically and consider pulling a small group as needed (see Differentiation Considerations). Have students collaborate to create their own ten words or less definition for each of the vocabulary words on their Force and Motion Vocabulary Terms Worksheet. Provide time for students to complete this before gathering briefly as a whole group to review the vocabulary terms and address any misconceptions. |
| **Independent Application and Demonstration of Learning**  Approximately 10-15 minutes | Have students transition to the independent work setting where they will apply what they know to determine which force and motion vocabulary term best fits given situations. Remind students that some vocabulary terms may be used more than once.  Pass out copies of the Force and Motion in the Real World Worksheet for students to complete independently. This can be used as a form of assessment, as needed. |
| **Closure**  Approximately 5 minutes | Bring students back to the whole group setting. Explain that they spent time today revisiting the ideas of force and motion. They thought critically to create short but informative definitions of Tier 3 vocabulary terms. In addition, they applied their knowledge of motion to a variety of scenarios to demonstrate their understanding.  Consider allowing students to keep their Motion Vocabulary Terms worksheet to students for use throughout the remainder of related lessons. |

**Next Steps and Reflection:**

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| What went well? |  |
| What changes might be beneficial? |  |
| Reteaching needs |  |
| Extension needs |  |