

Friction's Impact on Motion

Stage 1 - Desired Results

Big Idea(s)

Forces influence motion and matter in the universe.

PA Core Standards / Next Generation Science Standards

<u>T & E Education</u>	<u>Science Education</u>	<u>Mathematics Education</u>	<u>Computer Science</u>	<u>CEW</u>
	<p><u>S4.A.2.1: Apply skills necessary to conduct an experiment or design a solution to a problem</u></p> <p><u>S4.C.3.1: Identify and describe different types of force and motion, or the effect of the interaction between force and motion</u></p>	<p><u>2.4.4.A.1: Solve problems involving measurement and conversions from a larger unit to a smaller unit.</u></p>		<p><u>13.2.5.E: Apply to daily activities, the essential workplace skills, such as, but not limited to: Commitment, Communication, and Team Building</u></p>

Essential Questions

- **What is the relationship between force and motion?**

Students Will Know

- Content specific vocab
 - Force
 - Motion
 - Inertia
 - Friction
- Steps of design process

Students Will Be Doing

- After watching the teacher introduction listed in the “Presentations” section below, students will watch the StudyJams video of Newton’s first law of motion:
<http://studyjams.scholastic.com/studyjams/jams/science/forces-and-motion/inertia.htm>
- Define **Newton’s First Law of Motion** as an **object at rest stays at rest and an object in motion stays in motion unless acted upon by an outside force.** This is directly related to the concept of **inertia**. Have students compare

	<p>how their prediction to the actual definition/meaning.</p> <ul style="list-style-type: none"> • Teacher explains that in this next experiment, students will learn about how some forces resist motion and slow down moving objects. • Introduce the idea of “friction” and explain that friction is one of these outside forces that can cause a moving object to slow down and stop • Set up a ramp height of 5 feet and length of 2 feet. Students are to send a toy car down the ramp and measure the distance the car travels (in cm and/or m) from the bottom of the ramp out. Do 3 trials of this. • Cover the ramp in sandpaper. Repeat experiment • Discuss their results and observations as a class. End with students making a conclusion of how the sandpaper affected the investigation.
--	--

Stage 2 - Evidence of Understanding

Assessments (Formative and Summative):	Performance Task(s)
<ul style="list-style-type: none"> • Informal Formative Assessments throughout unit: Questioning, Discussion, Teacher Feedback 	<ul style="list-style-type: none"> • Students will be measuring distance a toy car travels.

Stage 3 - Lesson Learning Targets

<p>Learning Activities:</p> <p>Learning targets are written from the students perspective.</p> <p>I can...</p> <ul style="list-style-type: none"> - Identify - List/Tell - Describe - Solve - Convert <p>These should lead up to answering the Essential Question(s).</p>	<ul style="list-style-type: none"> • I can define Newton’s First Law of Motion. • I can measure the distance a toy car travels. • I can describe the impact of friction on motion.
---	---

RESOURCES / LINKS

Activities	Presentations	Assessments
<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Begin by reviewing with students the definition of force as a push or pull on an object. • Introduce Newton's First Law of Motion with the following experiment: The Tablecloth Trick. <ol style="list-style-type: none"> 1. Find a tablecloth with no hem, or cut a piece of cloth to use. The more slippery the tablecloth, the better the experiment will work. 2. Spread out the tablecloth with one edge hanging off the table. 3. Hold onto the edge of the tablecloth with both hands. Pull straight down, towards your toes. Practice pulling the tablecloth straight down, as fast as you can. 4. Set the table. Practice with unbreakable cutlery and plates first. Build up to using more items. 5. Pull the tablecloth out from under the kitchen items. Remember to pull straight down, as fast as you can. <ul style="list-style-type: none"> • If you want to try, go ahead! If not, show the following video clip: http://www.planet-science.com/categories/experiments/magic-tricks/2012/04/tablecloth-trick.aspx • Explain to students that this experiment illustrated 	<ul style="list-style-type: none"> •

	<p>Newton’s First Law of Motion. Have students complete the following sentence “I believe Newton’s First Law of motion shows _____.</p> <p>_____ Have students share.</p>	
--	---	--

Name _____

HOT WHEELS FRICTION CHART

Directions: Send the toy car down the ramp. You will need to measure the distance the toy car travels from the bottom of the ramp out. Fill in the chart with your measurement in cm and m.

<u>Trial</u>	<u>Distance traveled in cm</u>	<u>Distance traveled in m</u>

Directions: This time, you are going to repeat the experiment, but first, cover your ramp in sandpaper. Write a prediction of how you think this will affect your results.

Prediction:

<u>Trial</u>	<u>Distance traveled in cm</u>	<u>Distance traveled in m</u>

Conclusion (Write about what effect the sandpaper had on your results)
