

County Implementation Award Program (CIAP) Math and Science Lesson

<p>Unit Title: Force and Motion</p>
<p>Lesson Title: Force and Motion: “What Makes a Roller Coaster Work?” research project</p>
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<p>Grade Level: 3rd</p>
<p>Time Frame: 5-7 days</p>
<p>Targeted Standard(s): NGSS 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. 3-PS2-2. Make observations and/or measurements of an object’s motion to provide evidence that a pattern can be used to predict future motion.</p> <p>ELA RI 3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently. RI 3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text Write informative/explanatory texts to examine a topic and convey ideas and information clearly. W 3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. 3.2a Introduce a topic and group related information together; include illustrations when useful to aiding comprehension. 3.2b Develop the topic with facts, definitions, and details. 3.2c Use linking words and phrases (e.g., <i>also, another, and, more, but</i>) to connect ideas within categories of information. 3.2d Provide a concluding statement or section.</p>
<p>Short Description of Targeted Phenomenon: Show students videos of the handmade rollercoaster park https://www.youtube.com/watch?v=YM5K_zUM48 Ask them to focus on the movement of the rides. Have them record what they notice and wonder.</p> <p>Equal and unequal forces have different effects on an object. As an object gets higher in the air, gravity can pull it down a greater distance.</p>
<p style="text-align: center;">Three Dimensions of NGSS</p> <p>Science & Engineering Practice/s (SEP):</p> <ul style="list-style-type: none"> Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered (3-PS2-1)

Crosscutting Concept/s (CCC): Patterns, Cause and Effect

- Patterns of change can be used to make predictions (3-PS2-2)
- Cause and effect relationships are routinely identified (3-PS2-1)

Interdependence of Science, Engineering, and Technology:

- Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process. (3-PS2-4)

Disciplinary Core Idea/s (DCI):

- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2)
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Language Supports:

[slide deck](#) or anchor chart with visual vocabulary (incline, force, acceleration, momentum, inertia, centripetal force, energy, motion)

Materials Needed:

Computers or tablets, presentation software (Keynote, Slides or PowerPoint)

[How Roller Coasters Work](#)

[How do Roller Coasters Work?](#)

Objective(s):

1. Students will conduct research into the scientific forces behind a roller coaster.
2. Student will take notes from at least 2 sources
3. Students will create a written report or slide presentation that includes their findings.

How Math and Science concepts/skills/practices were integrated in this lesson:

PS2.A: Forces and Motion

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developed.) (3-PS2-2)

PS2.B: Types of Interactions

Objects in contact exert forces on each other. (3-PS2-1)

Possible Challenges /Misconceptions:

Students lack understanding of vocabulary concepts. Students inability to take notes from the material-plagiarism.

Formative Assessment:

Circulate while students are conducting research and check for understanding. Evaluation of finished report or presentation.

Lesson Opening

Teacher Actions

Activate prior knowledge and student interest-teacher presents an interesting situation, phenomenon, or dilemma that helps students connect to the content.
Brainstorm with students how a roller coaster works. Scribe student responses on an anchor chart.

Student Actions

Discuss ideas with their peer group and share out with class.

Lesson Introduction

Teacher Actions

Getting students ready - teacher introduces the task and makes sure students understand *what* they are trying to accomplish, but not *how* they are to do it.
Model note taking techniques. Provide guiding questions for research.

Student Actions

Students will follow along with teacher modeling.

Body of Lesson

Teacher Actions

Students working on content - teacher observes students, monitors their progress, and provides clarification as necessary.
Monitor student work.

Research to find answers to the guiding question. Use time effectively and stay on task.
Take notes by paraphrasing information.

Lesson Closure

Teacher Actions

Wrapping Up - teacher facilitates group discussion, helps students share their work/progress, helps students make connections, and ensures that big ideas are brought forward.
Facilitate presentations. Provide feedback.
Summarize information.

Student Actions

Present report either orally or through a presentation. Ask questions and provide feedback to classmates.

Summative Assessment:

Student presentations of the material.

[Research Presentation Checklist](#)

Other Teaching Resources:

[The Wonder of Science](#)

Lab Safety:

Extensions (if any):