

Runaway Rocks: Understanding Laws of Motion

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Grade Level 1
Duration 2 class periods

National Standards
GEOGRAPHY
Element 5:
Environment and Society
 14. How human actions modify the physical environment
 15. How physical systems affect human systems

AZ Standards
ELA
Writing
 1.W.3 Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.

SCIENCE
Physical Science
 1.P3U1.3 Plan and carry out investigations which demonstrate how equal forces can balance objects and how unequal forces can push, pull, or twist objects, making them change their speed, direction, or shape.

Arizona Social Science Standards
Geography
Human-environment interactions are essential aspects of human life in all societies.
 1.G2.1 Compare how human activities affect culture and the environment now and in the past. Such as agriculture, industrialization, urbanization, and human migration.
History
The development of civilizations, societies, cultures, and innovations have influenced history and continue to impact the modern world
 1.H1.1 Explain how ideas and innovation can contribute to a community by utilizing primary sources (artifacts, photographs, newspapers, speakers) and secondary sources (biographies, stories, articles). ▪ Key examples include but are not limited to farming by irrigation

SIOP Elements		
Preparation Adapting content Linking to background Linking to past learning Strategies used	Scaffolding Modeling Guided practice Independent practice Comprehensible input	Grouping Option Whole class Small groups Partners Independent
Integrating Processes Reading Writing Speaking Listening	Application Hands on Meaningful Linked to objectives Promotes engagement	Assessment Individual Group Written Oral

Arizona English Language Proficiency Standards
Grade 1
Basic
Listening and Reading
 Standard 1 By the end of each language proficiency level, an English learner can construct meaning from oral presentations and literary and informational text through grade appropriate listening, reading, and viewing.
 B-1: ask and answer questions such as who, what, where, why, when, and how about key details in a text.

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B-3: sequence a series of events using key words and phrases.

Standard 2: By the end of each language proficiency level, an English learner can determine the meaning of words and phrases in oral presentations and literary and informational text. With moderate support, apply a developing set of strategies to:

B-1: determine the meaning of general academic, and content-specific words and phrases, and some common expressions.

Speaking and Writing

Standard 3: By the end of each language proficiency level, an English learner can speak and write about grade appropriate complex literary and informational texts and topics.

With moderate support, apply a developing set of strategies to:

B-1: communicate simple messages about a variety of topics, experiences, or events.

B-2: add appropriate drawings or other visual displays to clarify thoughts and feelings about a variety of topics, experiences, or events.

B-4: produce writing with appropriate organization on a variety of topics, experiences, or events using sentence frames.

Overview

Newton's Laws of Motion help us to understand and make predictions about the movements of objects all around us. Understanding the Laws of Motion can build a lifetime skill for dealing with problems at home or in the community.

Purpose

In this lesson students will learn the effects of force on objects. Students will carry out an investigation and construct a model to solve a real world problem. This lesson includes strategies for diverse learners (ELLs).

Key Vocabulary

force: a push or pull, can cause an object to move

motion: movement or change of position

gravity: a force that pulls things towards the center of the earth

friction: the resistance of motion when one object rubs against another

rock slide: rocks falling from the top of a slope or a cliff

Materials

- Book: Runaway Pumpkin by Kevin Lewis or YouTube video The Runaway Pumpkin (4.21 min) found at https://www.youtube.com/watch?v=1D_k8Gpq_Q
- Computer, projection device, internet
- Ping-pong balls
- Cardboard ramp

- Books
- Index cards
- Push pins
- Masking tape
- Runaway Rocks PowerPoint
- Vocabulary cards (English and Spanish Versions)
- Vocabulary Test (English and Spanish Versions)
- Student Worksheet--Explore (English and Spanish Versions)
- Student Assessment (English and Spanish Versions)
- Scoring Guide for Writing

Objectives

In this lesson students will be able to:

- Plan and conduct a science experiment
- Communicate in writing a sequence of events.
- Explain how the Laws of Motion can be applied to real world situations.

Procedures

SESSION ONE

Prior to this session: cut Vocabulary Cards into 3 sections—word, definition, and illustration.

Engage:

1. Begin the lesson by reading aloud the picture book The Runaway Pumpkin by Kevin Lewis or by projecting the YouTube video The Runaway Pumpkin (4.21 min) found at https://www.youtube.com/watch?v=1D_k8Gpq_Q

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2. Explain that today they will be experimenting with objects rolling down a ramp just like the pumpkin rolled down the hill in the book.
3. Group students in groups of 3 or 4 and let them experiment with ping-pong balls as they roll them down a cardboard ramp. Ask students to observe the movement of the objects? How far do the balls roll? When do the objects stop moving? **(Preparation: Linking to Background Grouping Option: Small groups, Application: Hands on)**

Explore:

4. Show students how to fold an index card into a tent. Tell the students that the paper tent represents a house. Then ask: What happens if a house is located at the bottom of the ramp? Have students make predictions to what will happen if they let an object roll down the ramp towards the house. Record predictions on the board. **(Preparation: Linking to Background, Integrated processes: Speaking and Listening)**
5. Have groups return to the ramp and test the objects rolling down the ramp. As students work, go from group to group and ask students to describe what is happening now with the ramp. Assist students by inserting key words such as “force” to describe the effect of the ball on the house. **(Integrated processes: Speaking and Listening; Grouping Option: Small groups; Application: Hands on)**
6. Distribute the English or Spanish versions of the Student Worksheet—Explore. Instruct students to draw their observations and describe their observations using First, Next, Last sentence starters. **(Integrating processes: Writing, Application: Linked to objectives)**
7. Select students to share their first, next, last sentences. Compare their observations to their predictions. Were the predictions correct? **(Integrated processes: Speaking and Listening)**

Explain:

8. Distribute to student groups the English or Spanish versions of the Vocabulary Cards that have been cut into 3 pieces. Model how each vocabulary word has a definition and an illustration using one of the words. Have students sort the vocabulary cards. Have groups share their matching vocabulary words with the whole class and make changes if needed. **(Grouping Option: Small groups, Application: Hands on, Scaffolding: Modeling)**
9. End the lesson with these statements:

- a. **Gravity** is the force that moves an object downward towards the earth and it is the force that pushes the ball down the ramp.
- b. The Laws of Motion says that an object in **motion** will stay in **motion** unless a force acts on it.
- c. Sometimes **forces** cause objects to move, and sometimes **forces** slow, stop, or change the direction of an object’s motion.
- d. In our case the ball kept rolling until it was slowed by the **friction** of the carpet or until it hit the resistance of the house.
(Scaffolding: Comprehensible input)

SESSION TWO

Elaborate:

1. Review the Vocabulary Cards from the previous lesson and remind students of the results of their investigation.
 2. Ask students if they have ever visited a city or town close to the mountains? Project slides 2-10 of the Runaway Rocks PowerPoint that display different places where people have built cities close to mountains.
 3. Project slide 11. Brainstorm pros and cons of living near the mountains. **(Application: Linking to background, Linking to past learning)**
 4. Explain that living next to mountains can have some risks. Sometimes, due to erosion or weather events, rocks can come loose and roll down the mountain slope. This is called a rock slide. Project slides 12-13.
 5. Play the video clip on slide 14 and point out the path that the boulder took as it rolled down the hill and into the farmhouse.
 6. Now present the student groups with the problem to solve. Inform students that the ping-pong ball represents a boulder rolling down a hill (the cardboard ramp) and the paper tent represents a house at the bottom of the hill. Their job is to save the house at the bottom of the hill. They will need to construct something on their hill that will change the motion of the rock so that it doesn’t hit the house. **(Application: Meaningful)**
 7. Show students the materials for construction: push pins, index cards, and masking tape. Allow time for small groups to construct and test their solution. **(Application: Promotes Engagement, Hands on)**
- Evaluate:**
8. Distribute the Student Assessment and instruct students to draw their problem (a rock slide happens and the rock about to hit the house)

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and their solution (what they created). They must also write at least one sentence to explain their illustrations.

9. Give the Vocabulary Test. (**Assessment: Written, Individual**)

Assessment

ELA and Science

The Student Worksheet—Explore can be graded for completeness. Mastery will be considered a score of 90% or higher.

The Vocabulary Test can be used to assess language acquisition. Mastery will be considered a score of 80% or higher.

ELA, Social Science, and Science

The Student Assessment can be graded using the Scoring Guide for Writing. Mastery will be considered a score of 12 points or higher.

Extensions

- Research technologies used around the world to prevent rock slide damage or to prevent avalanches.
- Do additional Reading: Oscar and the Cricket by Geoff Waring, Move It! By Adrienne Mason, Newton and Me by Lynne Mayer
- Play a game: Marbelous Marvel Coaster <https://pbskids.org/catinthehat/games/marbleous-marvel-coaster>

Sources

World Map from Arizona Geographic Alliance <http://geoalliance.asu.edu/azga/>

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