Energy and Waves

Grade 4th

Authors:

Jerry Gonzalez, Lakeside Union School District
Marjorie Mayen, Lakeside School District
Alejandra Morales, Lakeside Union School District
Lilah Onners, Santee School District

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Acknowledgements

Project Director: Cecilia Ochoa, Lakeside School District

Staff Developers:

- Heather Glanz, Santee School District
- Lucia Gonzalez, Lakeside School District
- Debbie Jenkins, Lakeside School District
- Gilly Ryan, Santee School District

Core Partners:

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Unit Reviewers:

- Dr. Andrea Cook, Adjunct Faculty, San Diego State University

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Introduction and Storyline

Introduction: IDEAS2.0 is a CA Math Science Partnership grant focused on incorporating the science and engineering, as well as the mathematical practices into science lessons in the elementary grades. The units were developed to help elementary teachers recognize how the science, engineering and mathematics practices drive instruction to build student understanding. The units align with the NGSS by addressing phenomenon, disciplinary core ideas and science and engineering practices. Crosscutting concepts were not a part of IDEAS2.0, and are not emphasized in the lessons.

In this unit, students explore energy as a wave that has amplitude and wave lengths. They investigate how energy can be changed (transferred and transformed) producing sound and light. They learn how to manipulate the properties of light for human use in making a periscope.

Anchor Phenomenon: Fireworks and Thunder and Lightning

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Investigative Phenomenon: Buoy/Surfers Bobbing in Water

Lesson 1 Buoy in the Water

This lesson is an introduction to energy. Students will reveal their prior knowledge about energy and begin to explore energy as a wave.

Lesson 2 Jump Ropes

In this lesson, students use jump ropes to further investigate how energy moves in a wave, but matter stays in place.

Lesson 3 Slinkies

In this lesson, students use slinkies to further investigate how energy moves in a wave, but matter stays in place.

Lesson 4 Labeling a Wave

Using waves in a tub of water, students create a wave on construction paper. They compare this model to their notebook drawings from Lesson 2 and 3, and label the parts of a wave in their model.

Investigative Phenomenon: Bouncing Balls Make Sound

Lesson 5 Energy Changes

In this lesson, students begin to explore that wave energy can be transferred by measuring bouncing balls and finally that energy can be transformed as mechanical energy is transformed to sound energy.

Lesson 6 Sound Waves

Students continue to learn about how mechanical energy is transformed into sound energy, measured with an iPad sound meter.

Lesson 7 Good Vibrations

Through investigations and video, students learn how wave frequency and amplitude affect pitch and volume.

Lesson 8 Perfect Pitch

Students build drums and guitars to explore how different instruments make sounds with different pitches. They order the instruments based on pitch using both their models and the iPad Sound meter.

Lesson 9 Fireworks

Fireworks are used as a phenomenon to connect sound and light. In this lesson students discuss how energy is transferred and transformed in a firework display.

Investigative Phenomenon: Light Travels

Lesson 10 Light Travels in a Straight Line

In this lesson, students begin to understand that light is energy that travels in a wave and that light rays travel in a straight line.

Lesson 11 Light Waves can be Transmitted or Absorbed

Students recall and use their prior knowledge (from grade 1) about how light is transmitted or absorbed using different materials.

Lesson 12 Light can be Reflected

Using mirrors, students conduct an investigation about how light is reflected.

Lesson 13 I Can See

In this lesson, students use their understanding that light is reflected to explain how humans see objects.

Lesson 14 Up Scope

The unit concludes with this lesson as an engineering application of waves and how reflected light waves can be used to build periscopes.