

## Unit 3: Waves and Applications

### 8<sup>th</sup> Grade Science

10 Class Meetings

*Revised June 2022*

#### Essential Questions

- How are waves used to transfer energy and information?

#### Enduring Understandings with Unit Goals

**EU 1:** Characteristics of waves represent repeating quantities, the number of times the pattern repeats, the maximum extent of the repeating quantity from equilibrium, and the distance in which the quantity repeats it's value.

- Apply the simple mathematical wave model to a physical system or phenomenon to identify how the wave model characteristics correspond with physical observations
- Calculate that the energy of the wave is proportional to the square of the amplitude
- Describe that the amount of energy transferred by waves in a given time is proportional to frequency

**EU 2:** Light travels in straight lines, but the path of light is bent at the interface between materials when it travels from one material to another.

- Investigate how waves of light interact with other materials through reflection, absorption, or transmission.

#### Standards

##### Next Generation Science Standards:

- **MS-PS4-1:** Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
- **MS-PS4-2:** Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
- **MS-PS4-3:** Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.

##### Common Core State Standards:

- **SL.8.5:** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
- **MP.2:** Reason abstractly and quantitatively.
- **MP.4:** Model with mathematics.
- **6.RP.A.1:** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- **7.RP.A.2:** Use ratio and rate reasoning to solve real-world and mathematical problems.
- **RST.6-8.1:** Cite specific textual evidence to support analysis of science and technical texts
- **RST.6-8.2:** Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
- **RST.6-8.9:** Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic

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- **WHST.6-8.9:** Draw evidence from informational texts to support analysis, reflection, and research

### ISAAC Vision of the Graduate Competencies

**Competency 1:** Write effectively for a variety of purposes.

**Competency 2:** Speak to diverse audiences in an accountable manner.

**Competency 3:** Develop the behaviors needed to interact and contribute with others on a team.

**Competency 4:** Analyze and solve problems independently and collaboratively.

**Competency 5:** Be responsible, creative, and empathetic members of the community.

### Unit Content Overview

#### 1. Components of Waves

- Illustrate a wave with each of the components included
- Demonstrate understanding of frequency, amplitude, and wavelength

#### 2. Light Waves Versus Sound Waves

- Compare and contrast light waves to sound waves
- Interpret how different forms of light waves will affect different substances

#### 3. Digital Information Transfer

- Design a plan to speed up the process of digital information transfer

#### Interdisciplinary Connection:

- Language Arts (**RST.6-8.1**) – Cite textual evidence to support analysis of science and technical texts, attending to the precise details of explanation of description
- Math – Reason abstractly and quantitatively
- Art – Multimedia art

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#### Daily Learning Objectives with *Do Now Activities*

##### Students will be able to...

- Interpret the different components that make up a wave.
  - Where are there waves in your life? Think past water!
- Compare and contrast properties of different types of waves.
  - Draw an energy wave and label 5 parts
- Organize a mathematical representation to show how the amplitude of a wave is related to the energy in a wave.
  - Draw two waves (one with high and another with low amplitude)
- Investigate the properties that make up light waves.
  - What is light made up of? How can you see it?
- Compare and contrast light and sound waves and the Doppler effect.
  - Has anyone ever driven past you with loud music? Explain what you heard and how the sound changes.
- Examine digital information transfer.
  - How is it possible that you can share a document at the same time with another student or teacher?
- Design a model to show that waves are reflected, absorbed, or transmitted through various materials.
  - Draw images of reflection, absorption and transmission
- Demonstrate content knowledge for success on the unit exam.
  - What concepts are you still confused about?

#### Instructional Strategies/Differentiated Instruction

- Whole group instruction
- Guided notes
- Student-led instruction
- Independent problem-solving
- Collaborative problem-solving
- Graphic Organizer
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Homework
- Word walls with visuals
- Small group instruction
- Manipulatives

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#### Assessments

##### **FORMATIVE ASSESSMENTS:**

- Warm-ups
- Whiteboards
- Mid-class check-ins
- Exit Slips
- Accountable Talk Discussions
- Do Now
- Student-led instruction
- Homework
- NGSS Interim Assessments
- Performance Task- “Wave Bender”
  - Problem-Solving Rubric

##### **SUMMATIVE ASSESSMENTS:**

- Quiz – EU 1 & EU 2
- Performance Task- “Wave Bender”
- Unit 2 Test

#### Unit Task

**Unit Task Name:** “Wave Bender”

**Description:** Students will design a model to show that waves are reflected, absorbed, or transmitted through various materials. Each student will illustrate or use multimedia sources to create their design before constructing it. Students will attempt to show that their model proves that waves are reflected, absorbed, or transmitted through materials that they select. To conclude, students will write a summary explaining how their model demonstrates that the waves interact with their materials.

**Evaluation:** Summative Assessment and Problem Solving Rubric

#### Unit Resources

- Flipped Google Classroom Videos
- Worksheets
- Laptops
- NGSS Interim Assessments
- Teach Engineering
- PALS