

Unit 4: Waves of Energy

4th Grade Science

35 Class Meetings

Revised June 2026

Essential Questions

- What patterns can we observe in waves, and how do these patterns help us understand how waves move energy?
- How can we use patterns to send and receive information?
- What are some ways people use light and sound to communicate?
- How can we design and test different solutions to transfer information using patterns?

Enduring Understandings with Unit Goals

EU 1: Pattern Transfer and Technology

- Information can be transferred using patterns of light, sound, or symbols.
- Patterns in technology can be used to communicate quickly and clearly across distances.
- Different solutions can be created to solve the same problem, and each may work better in different situations.
- Designing, testing, and improving a solution is an important part of how scientists and engineers solve problems.

EU 2: Sound and Vibrations

- Sound is caused by vibrations that travel through materials in waves.
- Observe patterns in sound waves, such as pitch and volume, which are affected by the speed and size of the vibrations.
- Sound can travel through solids, liquids, and gases, but behaves differently in each.
- Use what we know about sound and vibrations to design solutions that help people communicate.

EU 3: Sound Waves and Wavelength

- Sound travels in waves that move energy from one place to another.
- Waves have patterns, such as amplitude and wavelength, that affect how they look, sound, and behave.
- The properties of a wave determine how it can cause objects to move.
- Models help us understand how waves work, even when we can't see them.

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Standards

NGSS Standards and Common Core Standards:

4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.

3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled, and failure points are considered to identify aspects of a model or prototype that can be improved.

4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

CCSS.ELA-Literacy.RI.4.1: Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

CCSS.ELA-Literacy.RI.4.2: Determine the main idea of a text and explain how it is supported by key details; summarize the text.

CCSS.ELA-Literacy.RI.4.4: Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

CCSS.ELA-Literacy.RI.4.9: Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

CCSS.ELA-Literacy.W.4.2: Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

CCSS.ELA-Literacy.W.4.2.a: Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.

CCSS.ELA-Literacy.W.4.2.b: Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

CCSS.ELA-Literacy.W.4.2.c: Link ideas within categories of information using words and phrases (e.g., *another, for example, also, because*).

CCSS.ELA-Literacy.W.4.2.d: Use precise language and domain-specific vocabulary to inform about or explain the topic.

CCSS.ELA-Literacy.W.4.2.e: Provide a concluding statement or section related to the information or explanation presented.

CCSS.ELA-Literacy.W.4.4: Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience

CCSS.ELA-Literacy.W.4.5: With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

CCSS.ELA-Literacy.W.4.6: With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.

CCSS.ELA-Literacy.W.4.7: Conduct short research projects that build knowledge through investigation of different aspects of a topic.

CCSS.ELA-Literacy.W.4.8: Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information and provide a list of sources.

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CCSS.ELA-Literacy.W.4.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.

CCSS.ELA-Literacy.SL.4.1: Engage effectively in a range of collaborative discussions (one-on one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

CCSS.ELA-Literacy.SL.4.1.a: Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

CCSS.ELA-Literacy.SL.4.1.b: Follow agreed-upon rules for discussions and carry out assigned roles.

CCSS.ELA-Literacy.SL.4.1.c: Pose and respond to specific questions to clarify or follow up on information and make comments that contribute to the discussion and link to the remarks of others.

CCSS.ELA-Literacy.SL.4.1.d: Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

CCSS.ELA-Literacy.SL.4.2: Paraphrase portions of a text read aloud, or information presented in diverse media and formats, including visually, quantitatively, and orally.

CCSS.ELA-Literacy.SL.4.3: Identify the reasons and evidence a speaker provides to support particular points.

CCSS.ELA-Literacy.SL.4.4: Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

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.

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Unit Content Overview

1. Patterns Transfer Information

- Describe how patterns in light and sound can be used to send information.
- Create simple communication devices or models that use patterns to transfer messages.
- Compare the effectiveness of different solutions for transferring information.
- Design, test, and revise communication models or tools.

2. Sounds and Vibrations

- Identify that sound is produced by vibrating objects.
- Describe how sound travels through different materials (solids, liquids, and gases).
- Observe and explain patterns in sound related to pitch (frequency) and volume (amplitude).
- Construct simple models to demonstrate how sound waves move and how vibrations create sound.
- Apply knowledge of sound and vibration to design a device that uses sound to send or receive information.

3. Soundwaves and Wavelengths

- Identify and describe the parts of a wave, including amplitude and wavelength.
- Use models to show how sound waves travel and transfer energy.
- Explain how changing the amplitude or wavelength affects a wave.
- Demonstrate how waves can cause objects to move.
- Recognize wave patterns in everyday sounds and vibrations.

Vocabulary and Key Terms: sound, vibration, wave, frequency, amplitude, wavelength, pitch, volume, echo, sound wave, compression, rarefaction, energy, medium, air molecules, speed of sound, reflection, absorption, transmission, resonance

Interdisciplinary Connection:

- ELA

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Daily Learning Objectives with TWPS

Students will be able to...

- Define what a pattern is in science and technology.
 - *Describe what a pattern is and how does that apply to science and technology?*
- Give examples of how people use light and sound to send messages.
 - *How can we use sound or light patterns to send messages?*
- Explain how patterns can be used to send information.
 - *Explain how patterns could benefit sending information.*
- Recognize repeating patterns in sound and light communication (e.g., Morse code).
 - *When would someone need to use a pattern of sound or light to communicate? How could these systems of communication help?*
- Send a message using a sound pattern.
 - *How do devices like cell phones or walkie-talkies send information?*
- Design a device that uses patterns to send a message.
 - *What makes a pattern easy or hard to understand?*
- Test how well the design works to send information.
 - *How can you determine if a design is working well? What indicators would you use?*
- Improve design based on test results.
 - *Explain restrictions to your design and how you will overcome them?*
- Compare my design to another and explain which worked better and why.
 - *What are some questions that you can ask another engineer about their design?*
- Describe what sound is and how we hear it.
 - *What do you think causes sound?*
- Explain that sound is caused by vibrations.
 - *How can you tell if something is vibrating?*
- Observe and record how different objects make sound.
 - *What happens to the sound if the object vibrates faster?*
- Identify high and low pitch sounds.
 - *What clues can you use to tell whether a sound has a high pitch or a low pitch, and how can you explain your thinking to a classmate?*
- Investigate how the speed of vibration affects pitch.
 - *How does changing the speed of a vibration change the pitch of a sound, and what evidence from your investigation supports your thinking?*
- Identify loud and soft sounds in the environment.
 - *What's the difference between a loud sound and a soft sound?*
- Explain how amplitude affects the volume of sound.
 - *How might a musician use their understanding of amplitude to change the way their music sounds, and why would this be important?*
- Describe how sound needs a medium to travel through.
 - *If sound can't travel through space, what does that tell us about how important a medium is, and how do we know?*
- Compare how sound moves through solids, liquids, and gases.
 - *Why do you think sound moves faster through some materials than others, and what does that tell us about the properties of those materials?*

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- Use a model to show how vibrations create sound.
 - *How could a model help you and others understand the invisible parts of how sound works?*
- Describe the parts of a sound wave, including crest and trough.
 - *What might change in a wave's crest and trough if the sound becomes louder or higher-pitched, and why?*
- Define amplitude and wavelength in a wave.
 - *Why is it helpful to know both amplitude and wavelength when trying to describe or measure a sound?*
- Show how changes in amplitude affect loudness.
 - *Can you think of a real-life situation where controlling amplitude is really important? What might happen if you didn't?*
- Show how changes in wavelength affect pitch.
 - *Why do you think shorter or longer wavelengths make different pitches, and how can you tell in an instrument or a model?*
- Observe wave patterns using classroom models.
 - *What patterns do you notice in waves, and how can those patterns help you predict or understand sound behavior?*
- Identify wave patterns in musical instruments.
 - *What do you notice about how different instruments create different wave patterns, and how does that affect the sounds we hear?*
- Explain how waves transfer energy.
 - *If waves carry energy, how can we prove that energy was transferred from one place to another?*
- Describe how waves can cause objects to move.
 - *Why do you think a wave can move an object even though we can't always see the wave itself?*
- Build and test a simple model that shows sound wave motion.
 - *What did you learn from building your model that you might not have understood just by watching or reading?*
- Explain how a wave model helps us understand sound.
 - *What are the strengths and limits of using a model to explain how sound works? What could your model not show?*
- Explain the connection between sound, vibrations, and waves.
 - *How do vibrations, waves, and sound all connect to each other like parts of a system?*
- Describe how sound and wave patterns help us understand energy transfer.
 - *How can looking at wave patterns help scientists or engineers understand how energy moves through different materials?*
- Present communication model to explain how it uses sound patterns.
 - *How do different parts of a communication system work together to send and receive sound, and what would happen if one part broke down?*
- Reflect on the engineering process.
 - *What was one challenge you faced while building or testing, and how did solving it help you better understand sound or waves?*

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Instructional Strategies/Differentiated Instruction

- Whole group instruction
- Paragraph frames and sentence starters
- Teacher modeling
- Think-write-pair-share and small-group discussions
- Graphic organizers
- Accountable talk
- Homework
- Word walls with visuals (Venn Diagrams)
- Small group instruction
- Visual exemplars with teacher and student critiques
- Text and video chunking
- Spiraling back to guiding questions
- Close reading with text-dependent questions

EL Differentiation Strategies

- Key vocabulary, Word Banks and Word Walls with visuals
- TWPS (Think, write, pair, share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit teacher modeling
- Graphic organizers
- Strategic Grouping
- Non-verbal assessments

Assessments

FORMATIVE ASSESSMENTS:

- Do Now
- Academic Discourse
- Exit Slips
- Accountable Talk Discussions
- Completed notes
- Completed graphic organizers
- Homework
- Performance Task -- Body Systems in Action: A Day in the Life of Your Body
 - Teacher's rubric/scoring guide

SUMMATIVE ASSESSMENTS:

- Quiz: Transferring information, Sound and Vibrations, and Wavelengths (EU1, EU2, and EU3)
- Unit Task: Communication Challenge: Save the Island! (EU1, EU2 and EU3)

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Unit Task

Unit Task Name: Communication Challenge: Save the Island!

Description: Upon completing the unit, students will work individually to design a communication system that uses light, sound, or symbols to transfer information. The system must use patterns to send a message, and you must test and improve your design before presenting it to the emergency response team. Scenario: A powerful storm has knocked out all cell phone towers and internet service on a small island community. The island's emergency response team (the students) need a way to send important messages between different locations. (EU1, EU2, EU3, and EU4).

Evaluation: Teacher's Scoring Guide

Unit Resources

- NewsEla
- Google Slides (Teacher's)
- Student Journals
- Chromebooks
- ReadWorks
- Virtual Fieldtrips
- Google Classroom
- Mystery Science