April Grade 4: Unit 4: Waves and Information

Content Area: **Science**
Course(s):
Time Period: **April**
Length: **6-8 Weeks**
Status: **Published**

Unit Overview

In this unit students will explore examples of wave properties, how waves affect objects, what waves travel through earth, and how sound and patterns are used to send messages.

Enduring Understandings

Waves have identifiable properties.

Waves can affect objects.

Waves can travel through the earth.

Sound and patterns help us to send messages through waves.

Essential Questions

What are some of the properties of waves?

How do waves affect objects?

Do waves travel through the earth?

How do we use sound and patterns in waves to communicate?

Instructional Strategies & Learning Activities

TEACHERS: These units are linked directly to TCI Science Alive! NGSS teaching materials.

- 1
  What Are Some Examples of Waves?
  Students work with a partner to annotate models of three examples of waves: water waves, waves on a string, and sound waves. They annotate a diagram, a video, and a simulation for each.
  Reading Further: Walls of Water

- 2
  What Are Some Properties of Waves?
  Students develop a model that describes the patterns of waves. Then, using objects and diagrams, they model the properties of amplitude and wavelength. Finally, they act out these properties.
  Reading Further: Doing the Wave

- 3
  How Do Waves Affect Objects?
  Students observe videos showing water waves, waves on a string, and sound waves. They discuss what causes these waves and what effects the waves have on objects. They present their findings to the class.
  Reading Further: Boom!

- 4
  Which Waves Travel Through Earth?
  Students use their bodies to model how Earth's crust moves during three types of seismic waves that occur during earthquakes. They compare seismic waves and play a game.
  Reading Further: Protecting People from Tsunamis

- 5
  How Can Sound Waves Be Used to Send Messages?
  Students use patterns of sound to communicate information about geometry concepts.
  Reading Further: The Loneliest Whale in the World

- 6
  How Can Patterns Be Used to Send Messages?
  Students act as engineers to design digital devices that send secret messages. They determine which device works best.
  Reading Further: The Artist Behind Morse Code

Integration of Career Readiness, Life Literacies and Key Skills

Students explore the career of engineers.

	An individual's passions, aptitude and skills can affect his/her employment and earning potential.
9.2.5.CAP.1	Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
9.2.5.CAP.2	Identify how you might like to earn an income.

9.2.5.CAP.3	Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).
9.4.5.CT.4	Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community and global (e.g., 6.1.5.CivicsCM.3).
9.4.5.IML.1	Evaluate digital sources for accuracy, perspective, credibility and relevance (e.g., Social Studies Practice - Gathering and Evaluating Sources).
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology and Design Integration

-Online games for each unit

-Generation Genius

-Bill Nye

-Brainpop

-TCI website

	Computing devices may be connected to other devices to form a system as a way to extend their capabilities.
	Information needs a physical or wireless path to travel to be sent and received.
8.1.5.NI.1	Develop models that successfully transmit and receive information using both wired and wireless methods.
8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
	Engineering design is a systematic and creative process of communicating and collaborating to meet a design challenge. Often, several design solutions exist, each better in some way than the others.
8.2.5.ED.1	Explain the functions of a system and its subsystems.
8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
8.2.5.ED.3	Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
8.2.5.ED.4	Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).

8.2.5.ED.6	Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.
TECH.8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
TECH.8.1.5.A.CS1	Understand and use technology systems
TECH.8.1.5.A.CS2	Select and use applications effectively and productively.

Interdisciplinary Connections

LA.RI.4.1	Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
LA.RI.4.2	Determine the main idea of a text and explain how it is supported by key details; summarize the text.
LA.RI.4.3	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
LA.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.
LA.RI.4.5	Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.
LA.RI.4.6	Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.
LA.RI.4.7	Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
LA.RI.4.8	Explain how an author uses reasons and evidence to support particular points in a text.
LA.RI.4.9	Integrate and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) information from two texts on the same topic in order to write or speak about the subject knowledgeably.
LA.RI.4.10	By the end of year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
LA.RF.4.3	Know and apply grade-level phonics and word analysis skills in decoding and encoding words.
LA.RF.4.4	Read with sufficient accuracy and fluency to support comprehension.
LA.W.4.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LA.W.4.4	Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
LA.W.4.5	With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.
LA.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.
LA.W.4.7	Conduct short research projects that build knowledge through investigation of different aspects of a topic.

LA.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.
LA.W.4.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.W.4.10	Write routinely over extended time frames (time for research, reflection, metacognition/self-correction and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
LA.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.
LA.SL.4.2	Paraphrase portions of a text read aloud or information presented in diverse media and formats (e.g., visually, quantitatively, and orally).
LA.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.
LA.SL.4.5	Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.
LA.L.4.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
LA.L.4.2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
LA.L.4.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
LA.L.4.4	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.
LA.L.4.6	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., quizzed, whined, stammered) and that are basic to a particular topic (e.g., wildlife, conservation, and endangered when discussing animal preservation).

Differentiation

- Understand that gifted students, just like all students, come to school to learn and be challenged.
- Pre-assess your students. Find out their areas of strength as well as those areas you may need to address before students move on.
- Consider grouping gifted students together for at least part of the school day.
- Plan for differentiation. Consider pre-assessments, extension activities, and compacting the curriculum.
- Use phrases like "You've shown you don't need more practice" or "You need more practice" instead of words like "qualify" or "eligible" when referring to extension work.
- Encourage high-ability students to take on challenges. Because they're often used to getting good grades, gifted students may be risk averse.

- **Definitions of Differentiation Components**:

    - Content – the specific information that is to be taught in the lesson/unit/course of instruction.
    - Process – how the student will acquire the content information.
    - Product – how the student will demonstrate understanding of the content.
    - Learning Environment – the environment where learning is taking place including physical location and/or student grouping

Differentiation occurring in this unit:

Utilize differentiation suggestions in the TCI Science Alive! program for enrichment and support.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

Utilize 504 and IEP accommodations where required.

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

DRA

Additional Benchmarks used in this unit:

-End of unit assessments

-Online quizzes

-TCI packet responses

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

Formative Assessments used in this unit:

TCI worksheets, quizzes

Discussion

Teacher observation

Labs and Hands on activities

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

Unit assessments in the TCI program

Instructional Materials

Materials for labs indicated in TCI program

Standards

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. Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves. Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.
PS4.A	Wave Properties Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (Note: This grade band endpoint was moved from K–2.) Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). Patterns Similarities and differences in patterns can be used to sort and classify natural phenomena.
4-PS4-2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. Assessment is limited to macroscopic structures within plant and animal systems.
LS1.D	Information Processing Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.