Unit 4 - Waves and their Application in Technologies for Information Transfer

Content Area: **Science**
Course(s):
Time Period: **Full Year**
Length: **Full Year**
Status: **Published**

Unit Overview

In this unit of study, students use a model of waves to describe patterns of waves in terms of amplitude and wavelength and to show that waves can cause objects to move. The crosscutting concepts of patterns; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, and constructing explanations, and designing solutions. Students are also expected to use these practices to demonstrate their understanding of the core ideas.

Enduring Understandings

Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks).
An object can be seen when light reflected from its surface enters the eyes.
Digitized information can be transmitted over long distances without significant degradation.
Sound can be natural or artificial. Both of which can be measured using pitch and volume.
Sound is reflected and/or absorbed by different materials. The nature of materials that sound travels through affects the transmission and absorption of sound.
The structure of the human ear and sound devices can enhance the quality of hearing.
Technology has influenced sound and how our society uses sound for communication.

Essential Questions

What are waves?
How does light reflect?
How is information transferred from place to place?

Learning Objectives

Complete investigations and hands-on activities to explore the effects of motion.
Discover the different parts of waves.
Explore how light can be reflected.
Examine and describe how information is transferred from place to place.
Model the way programs store and manipulate data by using numbers or other symbols to represent information.

Explore careers related to computer science and physics.
Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

Standards: Content

4-PS3-1	Use evidence to construct an explanation relating the speed of an object to the energy of that object.
3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
4-PS3-2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
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.
4-PS3-3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.
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-PS3-4	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
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.
4-PS4-2	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
4-PS4-3	Generate and compare multiple solutions that use patterns to transfer information.

Standards: Interdisciplinary

RI.CR.4.1	Refer to details and examples as textual evidence when explaining what an informational text says explicitly and make relevant connections when drawing inferences from the text.
RI.CI.4.2	Summarize an informational text and interpret the author's purpose or main idea citing key details from the text.
RI.IT.4.3	Describe the impact of individuals and events throughout the course of a text, explaining events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on evidence in the text.
RI.TS.4.4	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.
RI.PP.4.5	Compare and contrast multiple accounts of the same event or topic; noting important similarities and differences in the point of view they represent.
RI.MF.4.6	Use evidence to show how graphics and visuals (e.g., illustrations, charts, graphs, diagrams, timelines, animations) support central ideas.
RI.AA.4.7	Analyze how an author uses facts, details and explanations to develop ideas or to support their reasoning.
RI.CT.4.8	Compare and contrast the treatment of similar themes, topics and patterns of events in informational texts from authors of different cultures.

W.IW.4.2.A	Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), text features (e.g., illustrations, diagrams, captions) and multimedia when useful to aid in comprehension.
W.IW.4.2.B	Develop the topic with facts, definitions, concrete details, text evidence, or other information and examples related to the topic.
W.IW.4.2.C	Link ideas within paragraphs and sections of information using words and phrases (e.g., another, for example, also, because).
W.IW.4.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
W.IW.4.2.E	Provide a conclusion related to the information or explanation presented.

Assessment Evidence

Formative	Teacher observations, Class discussions, Lab Activities, Key concepts and vocabulary quizzes, Science Starter's/Do Nows, Open Ended Responses, Modeling, Simulations, Innovators Monthly Research, Lab Activities, Vocabulary Responses, Exit Questions, Interactive Digital Assessments embedded in Exploring Science Digital Book
Summative	Projects, Tests, Quizzes, lab skills demonstrations, projects, and vocabulary quizzes.
Alternative & Benchmark	Alternative - Read to the student and chart oral responses. Word banks, sentence frames, oral responses, graphic organizers, observations, portfolios of student work, orally administered assessments, and anecdotal notes. Benchmark – LinkIt Benchmark Assessment, Teacher Generated Assessments
Assessment Evidence Resource	

Instructional Resources

Smartboard, Computers, Websites and digital interactives/models, Multi-media presentations, Video Streaming, Brain Pop, Middle School Science, Generation Genius Digital Curriculum, Mystery Science Digital Curriculum, Amplify Digital Curriculum, Microsoft 365, Primary and Secondary Source Documents, Assorted lab materials

Instructional Resource List

Curricular Mandates

Below are the curricular requirements as defined in NJ Administrative Code and Statute

	Amistad	X	Diversity, Equity, and Inclusion
	Holocaust		LGBT and Disabilities (Grades 6-12)

	Climate Change	X	Asian American & Pacific Islander

Social Emotional Learning (SEL) Competencies

NJ Social and Emotional Learning Competencies & Sub-Competencies

	Self-Awareness	X	Relationship Skills
X	Responsible Decision-Making		Social Awareness
	Self-Management		

21st Century Skills & Themes

	Global and Cultural Awareness		Technology Literacy		Planning and Budgeting
X	Creativity and Innovation		Financial Institutions		Risk Management and Insurance
X	Information and Media Literacy		Digital Citizenship		Economic and Government Influences
X	Critical Thinking and Problem Solving		Credit Profile		Career Awareness and Planning
	Civic Financial Responsibility		Financial Psychology		