Unit 8 - Waves and Information

Content Area: **Science**
Course(s): **Science 4**
Time Period: **April**
Length: **Marking Period 4**
Status: **Published**

Unit Summary

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.

Standards

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.4.8	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.
MA.4.G.A.1	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.
SCI.4.4-PS4-3	Generate and compare multiple solutions that use patterns to transfer information.
SCI.4.4-PS4-1	Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
SCI.3-5.3-5-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.
SCI.3-5.3-5-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.

Student Learning Objectives

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

SLO 2: Generate and compare multiple solutions that use patterns to transfer information. (4-PS4-3)

SLO 3: 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. (3-5-EST-1-2)

SLO 4: 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. (3-5-ETS1-3)

Essential Questions

How can we use waves to gather and transmit information?
Part A: If a beach ball lands in the surf, beyond the breakers, what will happen to it?
Part B: Which team can design a way to use patterns to communicate with someone across the room?

Enduring Understandings

Students will learn to:

- 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. (4-PS4-1)
- Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1)
- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3)
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (secondary to 4-PS4-3)
- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2)
- At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)

Application

Students will be able to independently use their learning to:

- sort and classify designed products using similarities and differences in patterns.
- generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.
- 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.
- generate and compare multiple solutions that use patterns to transfer information. Examples of solutions could include:
    - drums sending coded information through sound waves;
    - using a grid of ones and zeroes representing black and white to send information about a picture;
    - using Morse code to send text.
- plan and conduct an investigation collaboratively to produce data that can serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
- 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.

Skills

Students will be skilled at: