Unit 5: Energy Movement

Essential Questions

How are waves described?
What are the types of waves?
What are the parts of a wave?
How does the speed of a wave relate to its frequency and wavelength?
What happens when waves interact?
What happens when waves interact with a boundary?

Instructional Goals

By the end of this unit, you should be able to do the following:

1. Examine factors that might affect the speed of propagation
   Show how a disturbance can be propagated.
   Understand terms - transverse and longitudinal
2. Demonstrate the behavior of wave pulses
   Show that the speed of pulses through a medium is constant.
   Determine the speed of a pulse through a medium.
   Examine the movement of a particle in the medium (history graph).
   Determine how the speed of a pulse is affected by changes in amplitude, pulse length, type of pulse, tension, or inertial properties of the medium.
   Show that waves transfer energy without the accompanying transfer of matter.
3. Demonstrate the behavior of transverse pulses in springs interacting with a boundary.
   Show reflection of a single pulse on a spring from a fixed end and a free end.
   Show reflection and transmission of a single pulse as it passes from one medium into another.
4. Examine the interaction of multiple pulses traveling on a spring
   Apply the principle of superposition to two pulses that meet in a medium.
5. Demonstrate the characteristics of periodic waves
   Demonstrate and give examples of how disturbances in a medium produce periodic waves.
   Introduce and develop a wave vocabulary.
   Explain how the frequency of mechanical wave is determined by the source, not the medium.
   Show how periodic waves in a finite medium produce standing waves
   Determine the relationships among frequency, wavelength and velocity using both graphical and mathematical representations.

Sequence

1. Demonstration 1 – Student transfer of energy via a rope
2. Activity 1 – Transverse pulses on springs
3. Exercise 1 – Transverse Waves
4. Activity 2 – PhET simulation – Wave on a string
5. Quiz
6. Activity 3 – Fixed and free end reflections
7. Exercise 2 – Reflection
8. Activity 4 – Transverse pulses interacting with other transverse pulses
9. Exercise 3 – Superposition
10. Demonstration 2 – Students transfer of energy via a slinky
11. Activity 5 – PhET simulation - Sound
12. Review
13. Test