**LESSON PLANS**

**PROPERTIES OF WAVES IN ONE DIMENSION**

Winter 2009 Student Teaching I work sample

Lesson 1 Feb 7th, 2009

**Grade level: 9**

**Subject:**

Physical science

**Time required:**

70 mins

Curriculum Framing Questions MISSING

**Standards**

* SC.HS.PS.05.01 Recognize that waves of all kinds have energy that can be transferred when the waves interact with matter.
* SC.HS.PS.06.04 Analyze the flow of energy through a system by applying the law of conservation of energy.
* SC.HS.SI.01 Based on observations and scientific concepts, ask questions or form hypotheses that can be answered or tested through scientific investigations

GOAL MISSING

**Objective:**

Identify properties of waves in one dimension

**Materials**

* Pre-assessment: Waves, Sound, Light, and Optics
* Large slinky
* Small slinky
* Stopwatch
* String
* Slinky Demonstration: Wave Properties handout

**Lesson**

Pre-assessment: Waves, Sound, Light and Optics (20 mins)

Hand out Pre-Assessment to students

Students work independently

TRANSITION MISSING

Class wave demonstration (20 mins)

Class stadium wave:

Class stands in a circle

Do “wave” like at a sports game

Experiment with decreased wavelength by starting multiples waves at once

Hip bump wave

5 or so people standing shoulder-to-shoulder in line

Person on end bumps hips into neighbor

Experiment with decreased wavelength by starting multiples waves at once

Discussion for each:  
 Notebooks out  
 Write objective of day

Note observations in notebook

Direction of wave travel

Direction of each person’s movement (displacement of media)

Identify wave type: transverse or longitudinal  
 Vocab of waves:

Wavelength, Freq, Crest & Trough, Amplitude, Interference, Reflection, Phase

Slinky demonstration (30 mins)

Hand out Slinky Wave handout

Find open space on floor

Demonstrate properties of waves by following prompts on Slinky Demonstration: Wave Properties handout

Discuss observations and fill out handout

CLOSURE MISSING

**Assessment**

* Students’ prior knowledge of wave characteristics and behavior will be assessed through short answer questions on the pre-assessment. Non-technical language will be used in the questions, and experiential scenarios will be used as context for questions.
* Throughout demonstration activities and class discussions, students’ knowledge will be further probed through questioning of their observations during the demonstrations and connections they can draw to their own experience.
* Students’ gained knowledge of wave properties and behavior will be assessed in a graphic organizer after completing the demonstrations.

**Accommodations**

* Instruction will be varied, incorporating writing, kinesthetic participation in demonstrations, visual observation of demonstrations, and class-wide discussion.
* Instructions will be verbalized in addition to written for students.

LITERACY STRATEGIES MISSING

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**SLINKY DEMONSTRATION: WAVE PROPERTIES HANDOUT**

**Transverse Wave**

Stretch a slinky on the floor. Shake one end sideways and observe the waves produced in the slinky.

1. Sketch the wave(s) in the slinky below:
2. Which direction do the particles in the medium vibrate?
3. Name a few examples of this type of wave that you can think of:

**Longitudinal Wave**

With the slinky stretched, scrunch up a section of coils on one end. Quickly release the bunch while still holding onto the end.

1. Sketch the wave(s) in the slinky below:
2. Which direction do the particles in the medium vibrate?
3. Name a few examples of this type of wave that you can think of:

**Speed of Waves**

* + Generate a small transverse pulse in the coil. Keep the stretch in the coil constant. Observe the speed of the pulse.
  + Generate a larger transverse pulse in the coil. Observe the speed of the pulse. Compare the speed of the pulses.
  + Repeat with different pulses to see if you can generate pulses with different speeds.

1. In a particular medium, are the different size pulses the same speed or not?

**Wavelength and Frequency**

Shake the spring back and forth rapidly to generate wave trains in the spring. The *wavelength* of a wave in the spring is the distance from a crest on one side of the spring to the next crest on the same side. The *frequency* of the wave is the same as the frequency at which you shake the spring.

* Shake the spring slowly at a constant rate. Observe the wavelength.
* Shake the spring rapidly at a constant rate. Observe the wavelength.
  1. Higher frequency waves have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (longer/shorter) wavelengths.
  2. Low frequency waves have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (longer/shorter) wavelengths.

**Wave Interference**

* + - Send pulses from each end of the wave simultaneously. Observe the pulses when they come together, and after they pass each other.
    - Send one pulse down one side of the spring while the person on the other end sends one down the opposite side. Observe the pulses when they come together, and after they pass each other
      1. When pulses are on the same side, what happens to their amplitude when they meet?
      2. When pulses are on opposite sides, what happens to their amplitude when they meet?
      3. After the pulses pass through one another, what happens to their amplitude?

**Reflected Waves**

Have one partner hold one end of the slinky rigidly in place. The other partner should send a pulse. Observe how the pulse reflects off of the end that is being held in place.

* + - 1. How does a pulse reflected from a rigid medium change?

**Wave Transfer From One Medium To Another**

Connect the slinky with the smaller coil spring. Stretch the slinky as before. Have your partner hold the end of the coil spring while you hold the end of the slinky.

* Generate a pulse from the slinky end. Observe the behavior of the pulse at the boundary between the slinky and the spring.
* Generate a pulse from the coil spring end. Observe the behavior of the pulse at the boundary between the slinky and the spring.

1. When a pulse reaches a boundary between the two springs it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (partially/totally) reflected and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (partially/totally) transmitted.
2. When a wave enters a new medium its speed is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (the same/different).
3. When a wave enters a new medium its wavelength is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (the same/different)