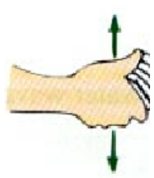
STEM Sound Investigations
Making Waves
Student Inquiry Sheet

Name_________________________________Class_____________ Date_______________

In this inquiry, you will explore the true nature of sound waves, or "vibrations that travel." Since we cannot actually "see" sound waves, we build models to better understand them. Audacity is one way of building a wave model. A Slinky can also be used as a model to make waves that we can see.

1. With your partner holding one end and you the other, stretch your Slinky. **When stretching a Slinky, it is very important to not drop it or let it go so that it gets tangled.** Make a wave by moving one end up and down or from side to side. This is called a transverse wave.

Sketch what the Slinky transverse wave looked like and what it did:



2. Still working with your partner, make a wave by squeezing the Slinky at one end together and releasing it. This type of wave, called a longitudinal or "compression" wave, is like a sound wave.

Sketch what the Slinky longitudinal or "compression" wave looked like and what it did:

3. Notice that in both waves, the wave can reverse direction and come back and forth. Explain how you think this is possible. What does this tell you about the behavior of waves?

4. Invent your own Slinky experiments to find out more about how waves behave. Then, answer the following questions:

   a. How is possible for the wave to travel across the Slinky since it is not moving back and forth? Or maybe it is moving?

   b. Does a wave have energy and how do you know?

   c. Explain how can you make waves with different amplitudes:

   d. Explain how can you make waves with different frequencies:

5. As a class, repeat some of your Slinky experiments <u>using a super Slinky</u>. **Like all Slinkys, handle your super Slinky with care. If you stretch it and let go, it will tangle itself and will no longer be useful.** You may also want to use 2 Super Slinkys to demonstrate the speed of a wave pulse by racing waves. What happens when you race a transverse wave against a longitudinal wave? What happens if you race the same type of wave with the Slinkys stretched to different lengths? What are 3 new observations you made using the Super Slinkys?

   a.

   b.

   c.

6. A sound wave is a longitudinal wave or a compression wave. Audacity shows a sound wave as a transverse wave. Discuss with some other students why Audacity shows sound waves the way it does. Then write your explanation here.

Check Point

6. You can see another model of transverse and longitudinal waves at http://paws.kettering.edu/~drussell/Demos/waves/wavemotion.html. Explain how these models compare to your drawings (models) of these waves?

7. Here are some other models that can help you better understand waves.

    a. Observe a Newton's Cradle (a stand with balls suspended so that they swing and hit each other). How is it possible for a ball on one side to make a ball on the other side move without touching it? How is a Netwon's Cradle like a sound wave?

    a. Have your class get in a circle and hold hands. Have one person gently squeeze the hand the person next to him. Then have that person pass the squeeze along. Record the time it takes for the signal to go completely around the circle. Divide that time by the number of people in the circle to get the time it takes to receive and pass on one squeeze. If each person represents one "vibration" what is the Hz of the signal? What is the average "wave length"?

    c. Make a chain reaction using dominoes. Is this a good model for the transfer of energy by a wave? If this was a wave, what would the wave length and frequency be? To see more dominoes falling down, search YouTube. Here is one link to get you started: http://www.youtube.com/watch?v=KdtjF5tXFe4

Check Point