Introduction to Waves Activity

Please be gentle with the springs. The springs are easily tangled and mangled. Please DO NOT overstretch the springs; they will become permanently deformed.

Start-Up:

Stretch your spring out to a length 15 floor tiles(each floor tile is 0.305 meter), with one person at each end holding the spring with one hand. (different springs will vary in distances needed to be stretched)

Part 1: Longitudinal (compressional) Waves

With your free hand, grasp the spring about 50 cm from the end. Pull the spring straight back toward your end of the spring, compressing the spring. Then release the spring, being careful not to let go of the spring.

1. Describe in words and drawings what you see after releasing the spring.

2. What happens to the wave when it reaches the other end of the spring?

Part 2: Transverse Waves

Move your hand very quickly and sharply to the right (about 30 cm- one tile) and back to its original position. Practice until you can produce a single large pulse that travels down only one side of the spring.

1. Describe in words and drawings what you see after releasing the spring.

2. Describe in words and drawings what happens to the wave when it reaches the other end of the spring.

3. Does the size of the wave change as it travels along the spring? Clearly describe what you see to support your observations.

Repeat this procedure, only this time use a stopwatch to measure how long it takes for the wave pulse **to travel from one end to the other and back.**
Record the data in the table below, and then calculate the speed of the wave.
Next, repeat the procedure for a larger pulse and again for a smaller pulse. Calculate the speed of the wave.

SHOW AN EXAMPLE CALCULATION:

Trial	Approx. height(m)	Length (m)	Time (s)	Velocity (m/s)
Original pulse				
Larger pulse				
Smaller pulse				

6. Does the speed of the wave change if you change the pulse size?
   If so, does the wave travel faster or slower when pulse is larger?
   If there is a difference, is it experimental error or does it appear to be a significant difference?

Part 3: Periodic Transverse Waves

So far, you've just been sending a single wave pulse down the spring.
By vibrating your hand steadily back and forth, you can produce a stream of wave pulses, called a periodic wave.
Try producing a periodic wave by vibrating your hand back and forth six or eight times (if you do it more you may get interference from waves reflecting off the stationary end of the spring).

Vary the rate at which you vibrate your hand; in other words, try shaking your hand back and forth slowly and then more quickly.

1. How does the length of the waves that you produce depend on how fast you are vibrating your hand? Describe using words and pictures.

2. Does the speed at which the wave travels down the spring (from one person to another) depend on how fast you are vibrating your hand? Try using the stopwatch to time them.

Part 4: Interference of Transverse Waves

In this section, you will be observing what happens when two transverse wave pulses meet each other. Move back to the original distance apart. The two people holding the ends of the spring will both send a single wave pulse at the same time, and you should observe what happens when the two waves meet in the middle. (It may be easier to observe what is happening if one student makes their pulse smaller than the other student).

1. If the two wave pulses are on the same side of the spring, what happens when the two waves meet in the middle of the spring? Describe in words and drawings what you see.

2. If the two wave pulses are on opposite sides of the spring, describe in words and drawings what happens when they meet in the middle of the spring?