EXPLORING WAVES (TEACHER'S GUIDE)

Introduction to the Activity

1. When you hear the word "wave," what things do you think of?

Student responses may include surfing, the ocean, a swimming pool, doing "the wave" at sporting events, etc. Ask about sound if students do not mention it.

2. What makes the behavior of a wave different from the behavior of something like an automobile driving down the road or a baseball flying through the air?

Wave motion appears continuous through a medium, whereas particles are at a specific location at any point in time. You can introduce the concept of waves mixing and adding, where two waves occupy the same space. Two particles cannot occupy the same space; they collide and often ricochet.

We use the term "wave" to describe many things we recognize in the world around us. "Wave" also describes the behavior of less obvious things like electrons, light, TV and radio signals, and cell phone data signals as they travel from one location to another. Let's learn about waves by making some waves with a spring and observing their characteristics.

Investigation

Have students work in pairs. Give each pair a Slinky® toy or another type of large spring. Each student should write their answers on their own handout. Find space in the classroom for students to conduct the activity and help students measure the stretched length of the spring.
***Note**: Make sure students keep the spring on a surface while making waves. If a spring is jerked around vertically in the air, it could get kinked and tangled or overstretched and ruined.*

Materials

A Slinky® toy or another type of large spring.

Procedure

1. Get a partner and a spring. Your partner's name: ______________________________
2. Find a place where you can stretch out the spring on a tabletop or on a tile floor. The spring must be on a surface, not dangling in the air!

3. Hold one end of the spring and have your partner hold the other end. Together, stretch the spring 3–4 meters. Your teacher can help you mark the distance.
4. Write down your observations as you work through each of the following questions:
   a. Can you make more than one type of wave that pulses through the spring? (*Try wiggling the spring from side to side or using a push-pull motion.*)

   Yes

   b. How many waves can you make with the spring at one time?

   Multiple; answers will vary.

   c. How big can you make the waves? (*Think: How can we use a meter stick to measure the waves?*)

   As big as you can wiggle the spring; answers will vary. Ask students how they would measure the wiggle.

   d. How is the size of a wave related to the number of waves you can make at one time?

   More waves = smaller size

   e. Does making more waves with the spring require more or less energy input?

   More

   f. How does the tension in the spring affect the waves? (*To increase the tension, gather some of the spring at one end and hold it while you make waves.*)

   Increasing the tension increases the number of waves on the spring (frequency).

   g. Does the whole spring stay at a different location when a wave pulses through it, or does it return to its original position? Does a wave accelerate as it travels, or does it travel with mostly constant speed?

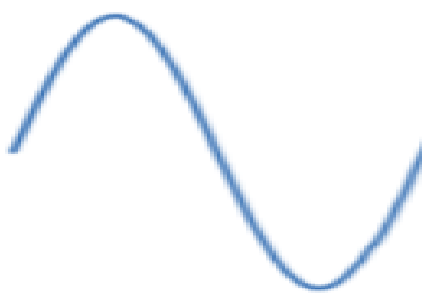
   The spring always returns to its original position after the pulse displaces it. Pulses do not accelerate; they travel with constant speed unless the tension is increased.

Reflection Questions

1. If you were describing the waves that you made to another person, what are some words you would use to describe the characteristics of the waves?

Answers will vary but should include descriptions of what we will later define as frequency, amplitude, and wavelength.

2. Draw a picture of the spring with one wave pulsing through it.



3. Draw a picture of the spring with multiple waves pulsing through it.