

Slinky Waves

CONTENT STANDARD: Physical Science

CONTENT TOPIC: Sound and Waves

CONCEPT: Waves (sound) are produced by vibrations and are transmitted through matter in all directions.

CONTENT OBJECTIVE: To understand how waves are produced and transmitted

INSTRUCTIONAL OBJECTIVES: The learner will:

- Discover how waves are produced.
- Discover how waves travel.

OUTLINE OF CONTENT:

- I. Sound is produced by vibration
- II. Sounds move through objects

GOAL: To enable students to demonstrate ways of thinking and acting inherent on the practice of science; and to exhibit an awareness of the historical and cultural contributions to the enterprise of science.

STANDARD(S): The learner will understand that:
Science is based upon suppositions derived from observations of natural phenomena.

BENCHMARK: Careful observation can yield scientific knowledge.

The validity of an investigation cannot be accepted unless the complete investigation can be independently duplicated.

BENCHMARK: If variables remain constant an investigation can be repeated with expectations of predictable results.

CLASSROOM CONNECTORS

TIME REQUIRED: 35 minutes

MATERIALS:

Slinky

SET: Listen. (Have children shut their eyes for a minute and listen for sounds). Open your eyes. Raise your hand if you heard a sound. (Share responses and list on the chalk board.) Can you see any waves around you? Today, you will learn what waves look like and how they travel to our ears.

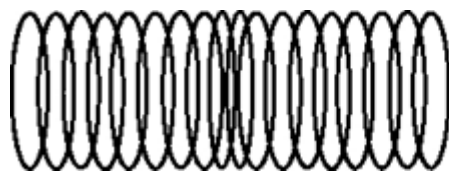
INSTRUCTION:

A Slinky can easily demonstrate some basic types of waves, *longitudinal*, *transverse*, and *standing*, as well as several others. A longitudinal wave vibrates parallel to (moves in the same direction of) wave travel (this is a good example of sound waves). A transverse wave vibrates perpendicular (moves at right angles) to the wave travel (water waves are a good example). When a number of waves are sent through a medium and then reflected back upon themselves, *standing waves* can be generated.

SUPERVISED PRACTICE: Have the students spread out on the floor and form teams of 2 students per team. This experiment works best on a hard floor (not carpeting).

Making Waves:

1. Have two students sit on the floor and each take one end of a Slinky and stretch it out along the floor. *Each student takes turns making waves.*
2. **Longitudinal Waves.** This is an example of a *Sound Wave*. One student must hold their end of the Slinky still (against their chest or stomach works best). Have the other student hold and pull toward themselves several coils of the stretched metal Slinky and then let go of the coils. A longitudinal wave will be made and will travel back and forth over the length of the Slinky.

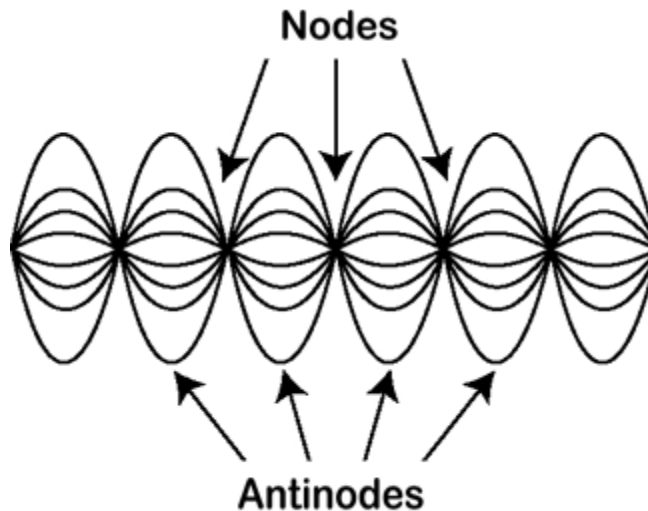


**Longitudinal
Waves**

3. **Transverse Waves.** This is an example of a *Water Wave*. One student must hold his or her end of the Slinky still on the floor. While holding the slinky on the floor, have the other student move their end of a (plastic or metal) Slinky, *in a single motion*, back and forth very quickly (left and right, like a snake crawling), perpendicular to its stretched length. A transverse wave will be made.



4. **Standing Waves.** After the students have demonstrated transverse waves, have them now make standing waves. One student must hold his or her end of the Slinky still on the floor. Have the other student move the Slinky constantly by changing the rate at which they move the Slinky back and forth. When a number of waves are sent through a medium and then reflected back upon themselves, *standing waves* can be generated. These specialized waves have places where the medium does not vibrate at all, called *nodes*, and other places where the medium vibrates the most, called *antinodes*. Standing waves have a changing numbers of nodes and antinodes.



Note: Graphics provided by Granger Meador, physics teacher, Bartlesville (Oklahoma) High School.

- *In your notebook, draw pictures of what you see happening with each type of wave.*
- Which way do the waves move?
- What happens when the “wave” hits the end of the slinky?
- Can you think of other places where you see waves?



CLOSURE:

Waves are created by vibrations. Vibrations are the sources of sounds.

- (Write this sentence on the board: Sound travels in _____ through the air.)
- Tell your neighbor what we have observed about waves today.
- What other types of “things” create and use waves? (TV, Phone, Cell Phones, water, radio, etc.)