Waves
5th Grade
Kelley Dunbar, Mr. Bellamy and Mrs. Cargle

Benchmarks:

SLC 10B: Identify simple patterns in physical phenomenon
   Benchmark: Students will investigate properties of light and sound waves.
SLC 5: Evaluate conclusions based on scientific data.
   Benchmark: Students will interpret data and answer questions about the information on tables, graphs, charts and/or text information.

Objectives:

Students will be reminded that both sound and light travel as waves. They will also learn the basic properties of waves and gain practice analyzing data tables and graphs. Vocabulary: crest, trough, wavelength, frequency.

Materials:

- Waves worksheet
- Waves overhead

Initial Demonstration:

Have the students gather around and choose a volunteer to hold one end of a slinky, while you take the other end and stretch the slinky out along the floor. Remind them that in science waves are used to describe any repetitive behavior. Waves are categorized into two types: longitudinal and transverse. Produce a longitudinal wave by pushing quickly against your end along the length of the slinky. Remind the students that they saw this just a couple classes ago during the sound lesson. Have them point out the compression as it travels down the slinky. Sound is a longitudinal wave. Light, however, travels as a transverse wave. You can produce a transverse wave on the slinky by shaking your hand back and forth. This type of wave should be more familiar to the students. Have the students observe the wave and share with you any patterns they notice.

Target Observations:

- Transverse waves move “in and out” repeatedly, at a fairly even time interval.

Target Model:

- Waves have repetitive behavior.
**Procedure:**

Draw a sine wave on the blackboard and label all the parts as below:

- **crest**: highest point of a wave
- **trough**: lowest point of a wave
- **wavelength**: distance from crest to crest, or from trough to trough
- **frequency**: number of waves per second

Discuss the wave and its properties. Have the students copy down the picture, with labels, and the definitions of the properties into their science journals. Next, draw a Cartesian coordinate system on the board and plot another sine curve. Discuss how we can use the numbers on the axes to describe the wave and predict future behavior. For example, the wave below has a wavelength of 20 (measured crest to crest or trough to trough). We can expect that the next crest will appear at \( x = 50 \) \((30 + 20)\). The next trough will appear at \( x = 60 \) \((40+20)\). If it takes one second for this wave to travel from \( x = 5 \) to \( x = 45 \), then the frequency of the wave (number of waves per second) is 2.

Once the students understand the concepts pass out the “Waves” worksheet and walk around the room while they work to complete it.
Use an overhead to review the worksheet. Be sure that the students understand that waves are repetitive, so we can use patterns in the data to make predictions about what will happen in the future. The characteristics of waves, namely wavelength and frequency, are used to describe properties of the things the wave is being used to model. For example, the frequency of sound is related to its pitch. As well, each different color of light has its own wavelength. Many things in nature have repetitive behavior so waves are a very important tool for scientists.

**Target Observations:**

- Waves repeat themselves after a certain amount of time.
- The number of waves per second is the frequency.
- Waves have high points and low points, aka crests and troughs.
- The distance between two crests or two troughs is called the wavelength.

**Target Revised Model:**

- Waves are used to model repetitive behavior.
- They are characterized by a wavelength and a frequency, which are related to the properties of the phenomenon being modeled.

**Summary:**

The students have become aware that light, like sound, travels as a wave. They also understand the basic properties of waves and have gained some practice analyzing data tables and graphs.