

"Making Waves"

Materials

for teacher demonstration:

- one length of rope 1-2 meters in length
- glass baking dish or wave box
- small marble or rock
- overhead projector

for each team of 3-4 students:

- rope
- prism and card with slot 3 mm wide cut in it
- access to sunlight, or to a "full-spectrum" light bulb/source
- card or 8" x 11" plain paper
- colored pencils or markers providing "all the colors of the rainbow"
- aluminum foil
- flashlight or other light without a shade and non-frosted bulb

Engage

Procedure for a teacher demonstration

Fill a glass baking dish with water and place it on top of an overhead projector. Turn the projector on, and (GENTLY!) drop the marble, or rock into the water and observe what happens. (Use the wave box if you have one available.) Have students record their observations in their SUNlogs. Have them draw the patterns they see being formed.

Explain/Explore

Group students in teams of 3-4 and give each team a 1-2 meter long piece of rope. Ask them to send a wave through the rope. Have them record their observations in their SUNlogs. Ask students if the wave causes matter to be transported through space. (Of course the rope moves up and down, but that's not what you're asking.) Accept all answers. Give each team a piece of colored tape or piece of yarn. Have them place tie the tape or yarn on the rope to mark a particular point on the rope. Direct students to keep their eye on the indicator as they once more send a wave through the rope. Again, ask students if the wave causes matter to be moved horizontally through space. Inquire why they may have changed their opinion. Reinforce through discussion that waves are energy passing through matter (water and sound) or space (electromagnetic radiation). Have students relate this to observations they have made in nature, such as ocean waves (the waves move, not the water) or skipping a rock across water (where the stone moves, not the water.)

Have one student hold the rope and initiate a wave. Ask students to describe the different characteristic components of what they are seeing. Help them associate what they see with scientific terms that can be used to describe all wave motions, of a rope, or sound, or light--amplitude, wavelength, frequency, etc. If this demonstration is done outside, close to a wall which can be marked up, chalk marks can be used to show each of the measurements. Explain that wavelength is a measure from the crest of a wave to the next crest. Amplitude is a measure from the rest position (in this case of the rope) to the crest or trough (which will be the same.) Frequency is the number of wave crests that pass a point in one second. Record this data in their logbooks.

Provide each team with a square of aluminum foil. Have them use a straight pin to punch two holes about 0.5 cm apart. Turn on the flashlight or other bright light. Have them take turns holding the light and looking through the foil. Hold the aluminum foil about 30 cm in front of their faces. Close one eye and look through both holes. They should be able to see the crests and troughs in the light emitted from the source. Record observations in the SUNlogs.