Curiosity Guide #609
Waves

Accompanies Curious Crew, Season 6, Episode 9 (#609)

Design a Gumdrop Wave Machine

STEM Challenge

Description

Make your own wave machine!

Materials

- Duct tape
- Marker
- Ruler
- 2 pipe clamps
- Wooden skewers
- Gumdrops

Procedure

1) Attach the pipe clamps, one on each end of a table.
2) Pull out a long strip of duct tape so the sticky side is face up.
3) Attach each end of the duct tape onto each pipe clamp.
4) Make a mark every 5 cm on the duct tape.
5) Place a centered skewer on the sticky face of the tape at each of the marks.
6) Add a gum drop to each skewer end and adjust the depth to keep the tape strip running flat.
7) Predict what will happen when you twist one end of the strip.
8) Try jiggling the strip slowly or quickly. What do you notice?
9) Now remove half of the gumdrops from the machine and try the action again.

10) What do you notice?
11) What would happen if you added heavier or lighter gumdrops?
12) What would happen if the spacing were changed between the skewers?

My Results

Explanation

The wave machine is a great way to show the movement of transverse wave motion. The initial gentle twist on one end of the wave machine creates a disturbance. That twist moves through the machine to the opposite end before moving back through the machine.

The gumdrops add mass to the system, which causes the disturbance to happen more slowly and make observation easier. The energy transfers through the machine. Lifting the gumdrop higher increases the amplitude of the wave without changing the speed of the wave.

Jiggling the gumdrop more quickly results in a shorter wavelength with a higher frequency. The speed of the wave still doesn't change. In order to change the speed, you can remove half of the gumdrops from the machine. Now, sending a pulse from the gumdrop side speeds up as soon as the wave passes the boundary without the gumdrops. This is similar to how light waves speed up when they transition from traveling through glass to traveling in the air. Waves will also reflect off the end of the wave machine and travel back. Sometimes similar waves will combine and get bigger, or opposite waves will combine with a crest and trough and either cancel out or get smaller.

You can also make a smaller version with cellophane tape, mini-marshmallows, and toothpicks.

Explore new ideas. We saw how energy can travel through the wave machine, and we could start the disturbance by flicking or twisting one end of the machine. Waves in the ocean carry energy, too. In the ocean, the wave often starts from the wind colliding with the surface of the water and transferring energy. A wind blowing very hard over a big area can cause bigger and wider waves. Engineers are experimenting with capturing that wave energy with generators to produce electricity. Wave energy is a renewable resource with great benefits for all of us. Hooray! Surfs up!

Parents and Educators: use #CuriousCrew #CuriosityGuide to share what your Curious Crew learned!

WKAR