



Drexel-SDP GK-12 ACTIVITY

Activity Template

Subject Area(s): Physical Science

Associated Unit: Astronomy

Associated Lesson: Waves

Activity Title: Waves on a Slinky

Grade Level 6 (6-8)

Activity Dependency: None

Time Required: 30 minutes

Group Size: 4

Expendable Cost per Group: US \$4

Summary

In this activity, students learn about waves by experimenting with slinkies. The students first learn what waves are and different characteristics that can be used to describe them. Then students split into groups and are given a slinky. The students perform experiments on the slinky to determine wave properties and investigate reflection.

Engineering Connection

Engineers study and use waves in their work. For example, acoustic engineers need to understand sound waves and their interaction with different materials to successfully design a concert hall. Also, electrical engineers use electromagnetic waves many different devices such as a RADAR system. This activity will help students begin to understand what makes waves unique and how waves are commonly characterized.

Keywords

amplitude, frequency, reflection, slinky, wave

Educational Standards

- Science: 3.1B, 3.2B, 3.4C

- Math: 2.3

Learning Objectives

After this lesson, students should be able to:

- Describe a wave by its amplitude, wavelength, frequency, and speed.
- Explain the difference between a transverse and longitudinal wave.
- Explain that wave reflection can occur at a boundary.

Materials List

Each group needs:

- Slinky
- Stopwatch
- Tape measure or meter stick

To share with the entire class:

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Introduction / Motivation

Waves are all around us, but we can't see all of them. Waves from the sun, from cell phones, from speakers, all hit our body all the time. Engineers have learned to control these waves and can use them in many powerful ways in communication, detection, and energy transfer, just to name a few. Microwaves, for example, rely on the manipulation of electromagnetic waves to warm our food. Electromagnetic waves are the same ones that the sun emits. How many different kinds of waves can you name? (Brainstorm list on the board) Waves come in two different types, transverse and longitudinal, and we describe all waves by their amplitude, wavelength, frequency, and speed. In this activity we will investigate waves by creating them on slinkies. We will calculate their speed and see what happens when the waves reach a boundary. Waves are unique in that although the wave moves, the material that carries the wave can stay still. For example, in a football stadium a wave is carried by the audience all the way around the stadium, but no one is actually running around the stadium as the wave moves. This is a property of waves and we will verify that slinky waves behave the same way also.

Vocabulary / Definitions

Word	Definition
Wave	A disturbance which propagates with no permanent displacement of the carrying medium.
Transverse Wave	A wave in which the disturbance is perpendicular to the direction of propagation.
Longitudinal Wave	A wave in which the disturbance is parallel to the direction of propagation.
Amplitude	The peak magnitude of the disturbance.
Frequency	In a repeating wave, the number of peaks that occur per second.
Wavelength	In a repeating wave, the distance between two sequential peaks.

Procedure

Background

Before the Activity

- Make copies of worksheets.
- Prepare sets of a slinky, tape measure, and stopwatch for each group.

With the Students

1. Have a discussion with the class asking them to brainstorm all the kinds of waves they know.
2. Hand out the worksheet and ask the students to give you a definition of a wave.
3. Go over the vocabulary on the worksheet with the students and give them the definitions of unfamiliar words.
4. Hand out the materials and let them fill out the rest of the worksheet by experimenting with the slinky.
5. Supervise the group work, go from group to group, make sure the students are on the right track, and ask them to explain their observations.
6. After all the groups have finished the worksheet have a discussion with the class about the results. Were groups able to produce waves of different speeds on the slinky? What happened to the wave when it reached the end of the slinky?

Attachments

wave_activity_worksheet.doc

Safety Issues

- None

Troubleshooting Tips

If students are having trouble, you can demonstrate the waves for them on the slinky or find video clips on the internet of transverse and longitudinal waves on a slinky.

Assessment

Pre-Activity Assessment

Class Discussion: During this discussion you will see how familiar students are with waves. Ask them to list the waves they know and have them tell you any properties that are similar to all of them.

Activity Embedded Assessment

Worksheet: The worksheet will allow you to assess whether the students understand the vocabulary and can implement the definitions they have learned. In addition you will be able to see if the students can make new inferences from their observations.

Post-Activity Assessment

None

Activity Extensions

You can modify this activity with strings of different weights and pulling them at different tensions to examine the wave speed characteristic more in depth.

Activity Scaling

- For lower grades, more examples and demonstrations may be necessary as waves can be difficult to understand at first.

References

Russell, Dan. Longitudinal and Transverse Wave Motion. Kettering University. Accessed December 20 2008. <http://www.kettering.edu/~drussell/Demos/waves/wavemotion.html>
(Good reference with visual models of both types of waves)

Owner

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Name: _____

Waves

Vocabulary:

Wave-

Transverse Wave-

Longitudinal Wave-

Amplitude-

Wavelength-

Frequency-

Can you make a transverse wave on your slinky? Can you make a longitudinal wave? Draw a picture of what each wave looks like.

What do you think will happen when a wave reaches the end of the slinky?

Try it for both kinds of waves, write down your observations, and draw a picture of what happens.

Can you make waves of different speeds on the slinky? Try it and write your results