

Wave Interaction

2022 NHERI OSU HWRL REU

Summary

This lesson is meant to illustrate the concept of multiple waves interacting with one another. We will first introduce the concepts of constructive and destructive interference and how superposition enables these events to occur. These concepts will first be introduced by a physical demonstration. Participants on both ends of a slinky and/or rope will move the medium accordingly for each example. After the physical demonstration, the wave formulas will be introduced to show how the two propagating waves are modeled mathematically. These equations will then be showcased using an interactive computer software to show how changing certain values affects the wave.

Engineering Connection

Waves, wave interactions, super position

Audience

High school (9-12th grade)

Lesson Objectives

- Remember
- Understand
- Apply
- Analyze

Educational Standards

NGSS HS-PS4-1

Introduction

From water to sound to light, waves are an integral part of the world around and beyond us. One of the easiest ways to visualize and understand waves are those in the water, like at the beach. With this lesson, we'll illustrate how waves and their interactions, specifically interference, can be translated from a physical phenomenon into a mathematical one. Instead of using water or sound, we'll use ropes and slinkies to physically model the propagation of waves and how superposition can increase the amplitude of waves through constructive interference, or cancel them out by destructive interference. Understanding these interactions seen through these simple mediums can

then help understand how other types of waves interact, like water waves at the Oregon State University O.H. Hinsdale Wave Research Laboratory.

Procedure

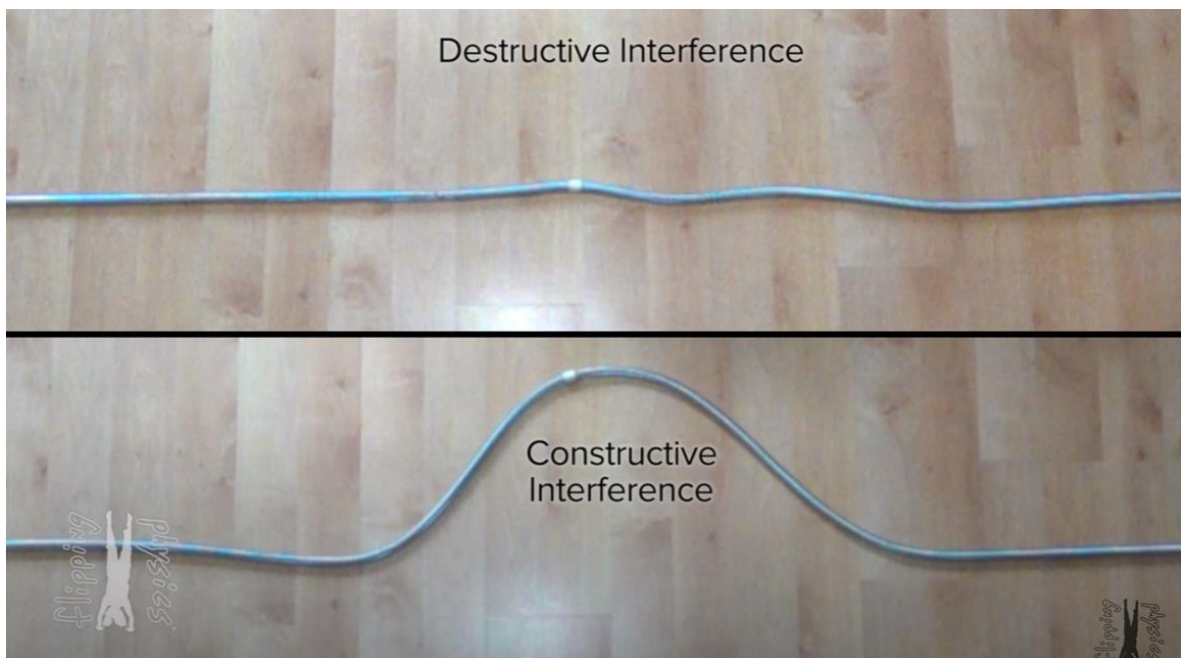
Background knowledge

- What are waves, what is interference and superposition

Before the activity

- Demonstration of constructive/destructive wave interference interactions
- Show simulation software changing values (amplitude, period, etc.)
- Pick partners for rope activity

During the activity



- Helping create waves on the rope

After the activity

- Kahoot exit ticket

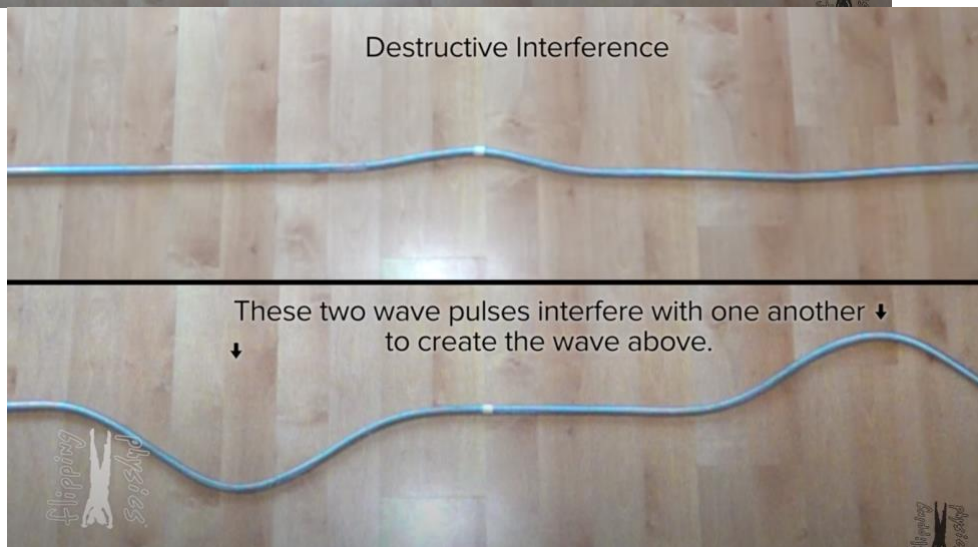
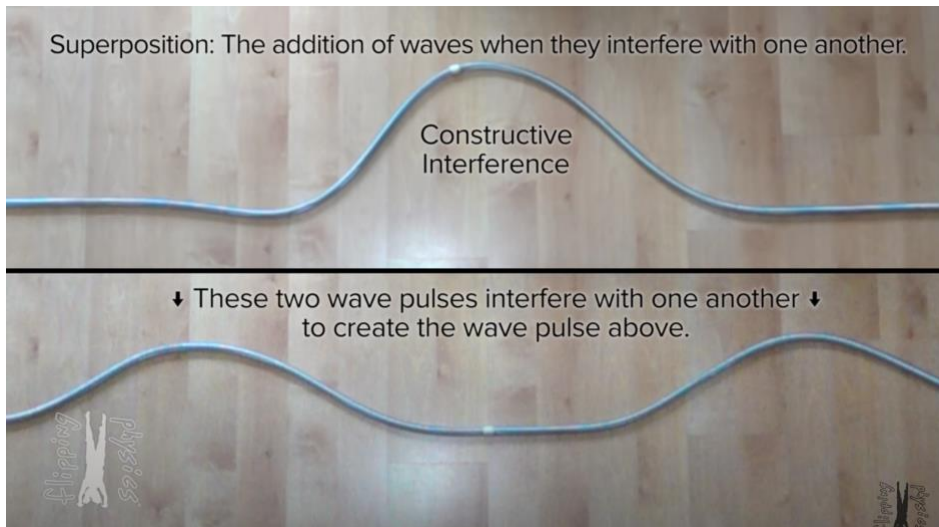
Material List

List the materials that will be necessary for the lesson/activity in bullet point form.

- Rope
- Slinky
- YouTube videos
 - superposition
 - standing wave
- Phone/laptop for Kahoot

Assessment

Make a constructive and destructive wave! This demonstrates mastery because it requires discussion of the different wave mechanisms that produce constructive vs. destructive interference.



Wrap-up

- Draw images of different (creative!) waves before and during superposition, 3-5 questions
- Connection to real world - sound waves and instruments + music example