

Lesson Plan

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| Assessment | AFL, questions |
| Cross-curricular | Arts |

Big Ideas

- Light and sound are forms of energy with specific properties
- Sound is created by vibrations
- Light is needed to see

Learning Goals

- Learn that light and sound are energy in the form of waves.
- Light and sound properties play a crucial role into making a great rock concert.
- Light and sound can be reflected
- We can feel sound vibrations in the air

Specific Expectations:

- 2.2** investigate the basic properties of light
- 2.3** investigate the basic properties of sound
- 2.5** use scientific inquiry/research skills to investigate applications of the properties of light or sound
- 2.6** use appropriate science and technology vocabulary, including natural, artificial, beam of light, pitch, loudness, and vibration, in oral and written communication
- 3.1** identify a variety of natural light sources (e.g., the sun, a firefly) and artificial light sources (e.g., a candle, fireworks, a light bulb)
- 3.2** distinguish between objects that emit their own light (e.g., stars, candles, light bulbs) and those that reflect light from other sources (e.g., the moon, safety reflectors, minerals)
- 3.5** explain how vibrations cause sound

Description:

This is **lesson one** of five lessons where we look at light and sound through the prism of creating a rock concert (or other light and sound show). Each lesson can be done on its own as well. Many excellent lessons on light and sound experiments exist. The idea of this set of lessons is therefore not necessarily to cover all the bases with the standard experiments, but rather to offer a unique and hopefully exciting approach to the topic through the goal of creating a concert – which is literally a light and sound show.

Materials/Resources:

Slinky Balloons
 Mirrors LED finger lights
 Spray bottle with misting nozzle

Safety Notes

Introduction

Introducing the concept

- Ask: Where do people use light? Sound? Where do we use them together?
 - Get to concerts being a great example of this.
 - The next five lessons we will learn about light and sound by working on creating our own “rock” show.
 - What are light and sound? Let’s investigate!
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Action

Playing with Slinkys

- Both light and sound are examples of waves. Let’s learn a bit about waves.
- Get volunteers to hold a slinky and generate standing waves by shaking it back and forth on a table (side to side, not up and down).
 - Discuss the properties of the wave (wavelength, amplitude). Discuss how you can change those properties and then try it.
 - When you shake the spring you transfer energy from your hand to it. The energy then travels along the spring from one side to the other. If you watch carefully you may notice that the wave then reflects (if the volunteer on the other end holds their hand still) and comes back towards you.
 - A light wave works just like this. Except the wave is not made of a slinky but pure energy. A light wave is a wave of electricity and magnetism (an electromagnetic wave). We can’t see light as a wave with our eyes because the peaks and valleys of the wave are VERY close together.
- We can generate a different sort of wave by shaking the slinky forward and backward instead of side to side.
 - This creates a longitudinal wave. We see areas of compression (slinky loops closer together) and areas of rarefaction (slinky loops further apart).
 - This is how sound waves actually work. Instead of a slinky what do you think might the wave travel through? (Get students to figure out that between a sound source (e.g. your mouth) and them, there is AIR. So sound travels through air.
 - We can compress the air, so all the little air molecules are really close together in one area, but further apart in another area. That is exactly what a sound wave is.

Light and Sound at a Concert

- Watch a video of a concert. Here is a suggestion:
https://www.youtube.com/watch?v=6ar-Rd9j_LM, or if you don’t mind a bit harder sounding music here’s an even greater light show:
<https://www.youtube.com/watch?v=jBiyNsqTZyo>
- Discuss how light and sound are used (colours, reflection, beams of light to highlight things, smoke, flames, volume, amplification, different sounding instruments)

- Would this show be even nearly as interesting without any light show and fancy instruments?
- Over the next few lessons YOU will create a great light and sound show!

Sound experiment

- Sound waves create vibration. Vibration is when particles (in this case, air molecules) shake back and forth.
- To feel how sound is a vibration, ask students to place hands on their neck and make the lowest sound they can.
- Then place hands in front of their mouths and again make a low noise. Can they feel the vibrations?
 - What you feel is the compressions in the air – just like in the slinky – that you made with your vocal chords.
- Now hold a blown up balloon in front of your mouth as you speak or sing.
 - Can you feel the vibrations?
 - Is it easier to feel than on your hand? (Yes, because the balloon amplifies the vibrations. A useful concept to get back to throughout the rest of this unit)
- Alternatively this experiment can be done with a subwoofer. You can hold your hand, a balloon or, for example, an aluminum plate in front of it to feel/hear the vibrations
- Changing sound: Now try to make different sounds by placing your hands or a paper shape (e.g. a cone) in front of your mouth. What kinds of sounds can you come up with?

Light Experiment

- Let's get started by playing with light and sound a bit more and creating our first "special" effects.
- Hand out mirrors and coloured LED finger lights.
 - Let students experiment with creating colourful reflections.
 - Will work best in a darkened room.
 - Optional: You can use water in a spray bottle with a misting nozzle to make the light beams visible.

Consolidation/Extension

- Today you did a couple of experiments with light and sound. What did you learn?
- You can change sound and light and combine them to create cool effects.
- Rock concerts and other shows use the properties of light and sound to create amazing shows.
- **Optional:** Get students to fill out the attached worksheet on today's learning.
- You'll keep building your own show based on what you learned today.

For next class:

- If you have musical instruments at home, bring ones you can spare for a few days to school. Particularly good ones are any stringed instruments, xylophones, drums, as well as wind instruments such as flutes.
 - It's not necessary that everyone bring an instrument as long as you have a good selection.
 - Students need not be able to play the instruments well.
 - Students will study the vibrations the instruments make and start thinking of how to incorporate instruments into a show.
- **Note:** If not enough students can bring an instrument to make lesson two work then you will have to spend part of that class building a simple instrument. You may wish to take an extra day to complete the unit. Encourage students to bring more than one instrument if they have more than one that they can bring.