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Light & Sound Curriculum Map

Light and sound are everywhere, but hard to define. These age-appropriate activities will provide your students with a solid basis for exploring these concepts with confidence.

Experiments with laser beams and hands-on models will delight students as they learn about light. Practical activities with music, hand made telephones, and model ears will instill a love for learning science in students while teaching the basics of sound.

Activities are curriculum-based and also include highly motivational experiences - like playing tag using echolocation, just like bats.

The experiments in this curriculum fall under nine topics: **Introduction to Light, Light and Society, spreading and Fading, Shadows, Transmission, Reflection, and Absorption, What Is Sound?, Humans and Sound, Echoes and Traveling Sound, and Pitch and Intensity.**

A tenth section on **Sound Machines** provides an excellent way to integrate the sound material that has been learned and introduce a technology component to the curriculum.

In each section, you will find teacher notes designed to provide guidance on the materials and setup needed, as well as highlight any safety precautions.

Introduction Includes:

- At A Glance TM - List of Skills and Learning Expectations
- Teacher Rubric
- Student Rubric
- Introduction
- Materials List

Lesson Topics:

Introduction to Light

- Teacher Notes
- Student Activities
 - **Can You See in the Dark?:** The students will often insist they can still see when in total darkness.
 - **The Source of Light** Worksheet
 - **Light Travels Fast:** Understanding that all light must have a source.
 - **Light Travels Straight:** Light travels straight and this is not affected by forces such as gravity, sound waves, and the motion of air.
- Answer Key

Light and Society

- Teacher Notes
- Student Activities
 - **You Light up My Life:** Encourage students to think not about “lights” as objects but light sources.
 - **Light-Detecting Plants** Experiment
 - **How We Use Light** Worksheets
 - **What Is a Light Bulb?** Worksheets
 - **Do Light Bulbs Waste Energy?** Experiment
- Answer Key

Spreading and Fading

- Teacher Notes
- Student Activities
 - **Making a Reflectometer:** A reflectometer is a simple device used to measure light reflecting off a surface.
 - **Does Light Spread Out? Part 1:** Students will tend to assume that even though light spreads out, more light is there to fill in the gaps.
 - **Does Light Spread Out? Part 2:** Some students will find it difficult to choose one area as high, medium, and lowest in terms of brightness but encourage them to do it as they see it; there is no right answer.
 - **Brightness Decreases with Distance** Experiment

- **How Does Light Spread Out?:** This analogy of light as sand allows for measuring and graphing.
- Answer Key

Shadows

- Teacher Notes
- Student Activities
 - **Changing Shadows:** This activity explores the nature of shadows.
 - **Shadows and Light:** The goal of this exercise is to have the students understand that the shape of a fixed object's shadow (in this case a block representing a building) is determined by the position of the light source.
- Answer Key

Transmission, Absorption, and Reflection

- Teacher Notes
- Student Activities
 - **I See Through You!:** The ability to read through the material is the best test for transparency/translucency.
 - **It's Play Time!:** This activity provides ample opportunity to explore the properties of transparent, translucent, and opaque materials.
 - **Bouncing Light:** The two objectives are to have the students anticipate and witness that light reflects at an expected angle, for example light striking at 45 degrees will be directed away at 45 degrees.
 - **What Reflects Light?:** Gray paper is not critical, colored paper can be used
 - **Absorbing Light:** This can be a class activity with one set of boxes or can be done by groups of students.
- Answer Key

What Is Sound?

- Teacher Notes
- Student Activities
 - **Where Does Sound Come From?:** Students learn about the different ways sound is produced
 - **Make a Kazoo** – Steps how to and a worksheet
 - **Does Sound Travel?:** This activity demonstrates how sound travels through the air once it is produced.
- Answer Key

Humans and Sound

- Teacher Notes
- Student Activities
 - **How Do Humans Make Sound:** Students will sing and use their fingertips placed on their throats to discover that it is vibration that produce singing and talking sounds.
 - **Make an Ear:** Students will make a model of an eardrum and see how it vibrates when sound reaches it.
 - **How Do Humans Hear Sound?:** Students will be made aware of basic ear anatomy, and relate this to what they have learned about how sound travels and how it is related to vibration.
 - **Why Do We Have Two Ears?:** Students will learn that having two ears makes it easier to determine where sounds are coming from.
 - **Sound Patrol Worksheets**
- Answer Key

Echoes and Traveling Sound

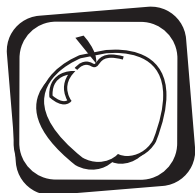
- Teacher Notes
- Student Activities
 - **Speed of Sound:** In this activity, the class goes to a large open space such as a football field.
 - **Sound Travels:** In this activity, the teacher places a radio in the middle of the class, speaker pointing upwards, and students sit around it.
 - **Blocking Sound:** In this activity, the students will learn that different materials can block sound more or less effectively.
 - **Echoes and Bats:** Echoes and echolocation are addressed in these activities.
 - **Bat and Mosquito Game:** Echoes and echolocation are addressed in these activities.
 - **Would You Be a Good Bat?:** Echoes and echolocation are addressed in these activities.
- Answer Key

Pitch and Intensity

- Teacher Notes
- Student Activities
 - **Make a Xylophone:** Students will build their own musical instrument (a xylophone with baby jars filled with various amounts of water) and the concept of pitch can be reinforced.
 - **The Intensity of Sound:** Students will learn to use a decibel meter to measure how loud a sound is.
 - **Sound Patrol:** A sound patrol will be formed and the students will search for potentially dangerous sources of loud noise around their school.
- Answer Key

Sound Machines

- Teacher Notes
- Student Activities
 - **How Does a Speaker Work?:** Students will see how a speaker inside a radio vibrates to create sound.
 - **Make a Tin Can Telephone:** Students will build a tin-can telephone.
 - **Make a Pan Flute:** Students will make musical instruments.
 - **Make a Guitar:** Students will make musical instruments.
 - **Sound Crossword** Worksheet
 - **Sound Wordsearch** Worksheet
- Answer Key



Introduction to Light

Teacher Notes

Can You See in the Dark?

The students will often insist they can still see when in total darkness. This is due to the continued firing of nerve cells on the retina. Some will even insist they see distinct shapes. The test to prove they are not actually seeing light is to hold an object such as a white ball in front of them, turn out the light, move the ball (e.g., put it on the floor) then ask them if they can see it. They will likely think it is still in front of them. Turn on the light and they will realize they could not see it.

Light Travels Fast

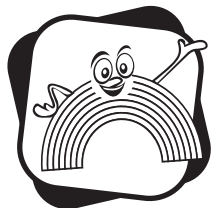
Understanding that all light must have a source, this activity enforces the concept that light must move from point A (the source) to point B (i.e., the wall). A difficult concept for young learners is that speeds can be so fast as to seem instantaneous. The purpose here is to teach them that while light does move from A to B, it does so very fast. The speed of light is 186,282 miles per second (300,790 kilometers per second).

Light Travels Straight

This principle has been simplified and is technically not 100% accurate. Light travels straight and this is not affected by forces such as gravity, sound waves, and the motion of air. However, light will react to heat energy. Students can be shown this as an advanced step by placing a candle directly below the laser beam (placed close to the source). This will cause the dot of light on the wall to move because the light is bending as it absorbs the additional energy.

**Common laser pointers are dangerous to the retina.
Students should be cautioned not to point it at faces or to look into the laser pointer.**





Can You See in the Dark?

Seeing and light go together. Look around you. Where does the light come from? All light has a source. A light bulb is a source. The sun is a source. If you remove the source of light you have darkness.

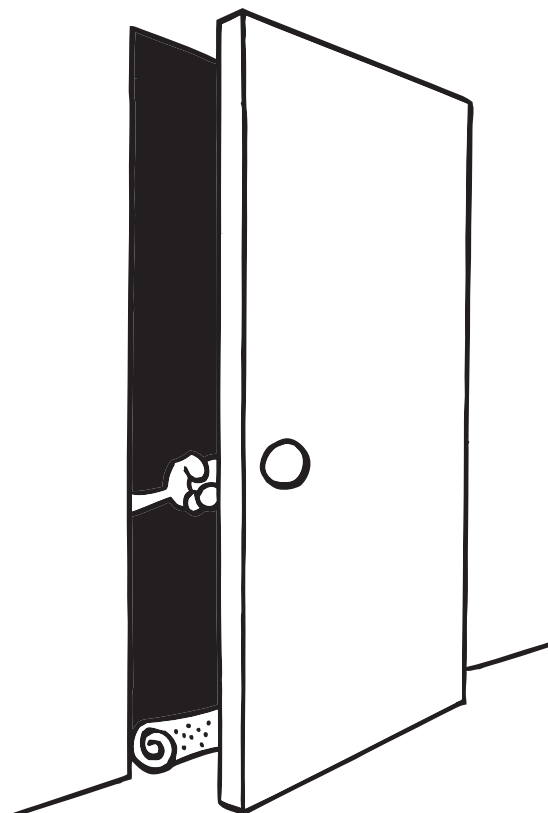


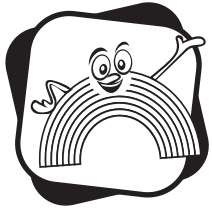
- a room with no windows and a door
- a towel to block light from under the door
- a tennis ball



With some classmates, close yourselves into a room with no windows. A janitor's closet works well. Identify the source of the light in the room. Then, switch the light off and look around you.

What do you see?





Can You See in the Dark?

Name: _____

Worksheet

The brain will "try" to see things in the dark. To test this put the ball somewhere in the dark room with the light on.



Will you be able to see the ball with the lights off? _____



Switch the light off and have a student move the ball.

What do you see? _____

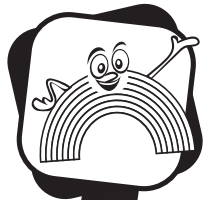
Where is the ball now? _____

Switch the light on. Where was the ball really?



Can you see in the dark? _____

If you have no light source, there is _____.

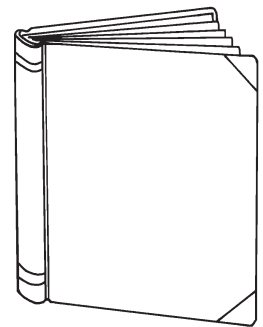
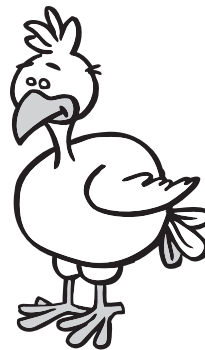
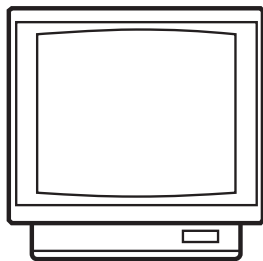
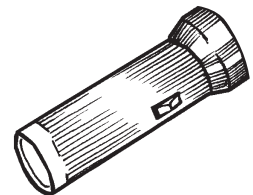
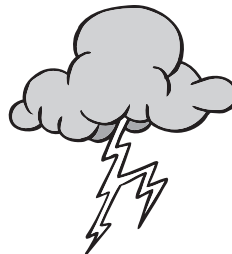
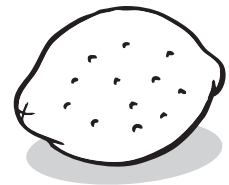
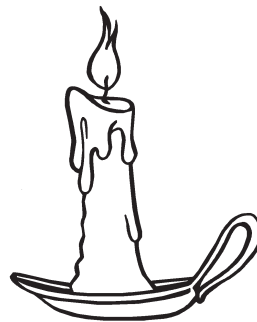
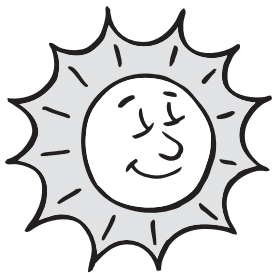


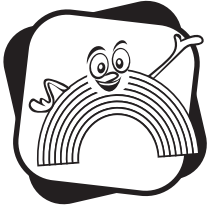
Name: _____

The Source of Light

All light has a source. The sun is a source of light. A light bulb is a source of light.

Look at the pictures below and circle the things that can be sources of light.





Light Travels Fast!

Light travels from the source to an object.



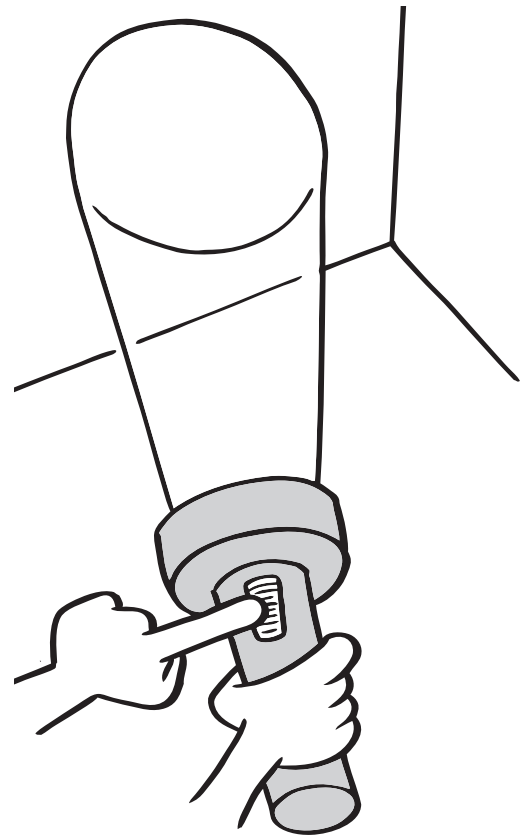
- a flashlight
- a partner



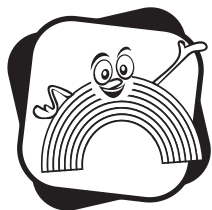
1. Shine a flashlight on the ceiling.

Light leaves the flashlight and travels up to the ceiling. Just as a car has speed, so does light!

2. Take turns with your partner turning on the flashlight while pointing it at a wall. Watch for the light to leave the flashlight and reach the wall.



Where does the light start?
Where does it finish?
How did it get there?



Name: _____

Light Travels Fast!

Worksheet

Light travels very fast! If you were on the Moon with a flashlight and you pointed it at Earth, it would take about one second to get here.



Will you see the light leave the flashlight and travel to the ceiling? _____



Turn the light on. What do you see? _____



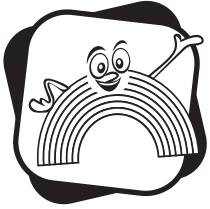
Why can't you see the light leave the flashlight and travel to the wall? _____

How fast do you think light travels? _____

Is light faster than a race car? _____



The speed of light is about 186,000 miles per second (300,000 kilometers per second).



Light Travels Straight

Light travels in a straight line. It leaves the light source and travels through the air.

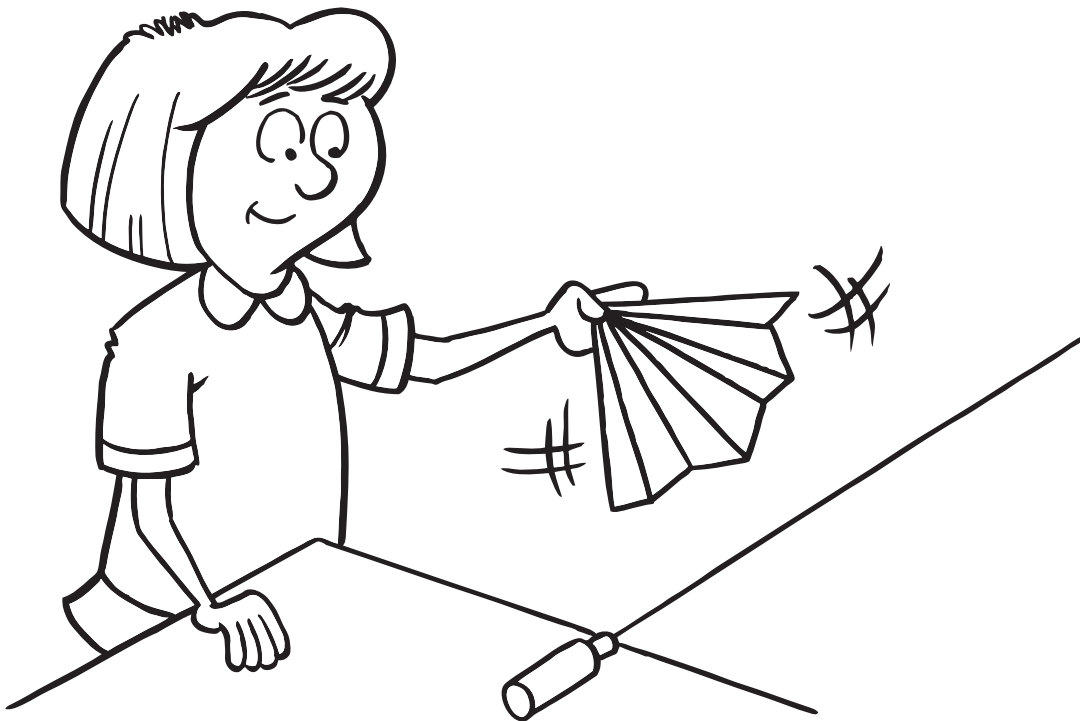


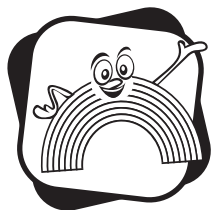
you'll need:

- a laser pointer



Shine a light across the classroom. Without touching the beam of light, try to make the dot on the wall move. Try anything you can to make it move. Noise, wind, another light. Be creative...just don't touch the beam.





Name: _____

Light Travels Straight

Worksheet



Draw what you think will happen to a beam of light from a laser pointer when you try to make it move:



Draw what happened when you tried to move the light:



Can you make the light move? _____

What direction does light travel? _____



Unless light hits a solid object it will travel straight across the entire universe!