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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

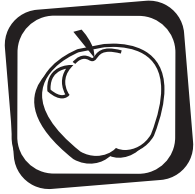
- Teacher Notes
- Student Activities
 - **Speed of Sound:** In this activity, the class goes to a large open space such as a football field.
 - **Sound Travels:** In this activity, the teacher places a radio in the middle of the class, speaker pointing upwards, and students sit around it.
 - **Blocking 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



What Is Sound?

Teacher Notes

Sound is usually produced by compressing or “squishing” air. This can happen in three basic ways:

1. **Vibration:** When an object vibrates, it intermittently compresses the air around it and produces a sound. For example, a drumstick hitting a drum makes the drum vibrate, or strumming a guitar makes its strings vibrate.
2. **Explosions:** Explosions rapidly compress the air around them and produce a sound like a “bang” or “pop”. A balloon that pops and fireworks are examples of explosions that produce sound.
3. **Flow of air:** When air flows against surfaces (for example, when we blow in a whistle or the wind blows against window sills) a whistling sound is produced.

Where Does Sound Come From?

Students learn about the different ways sound is produced. The experiment can be done as a group demonstration, with the students completing the worksheets individually, and reinforcing the concept of vibration in **Make A Kazoo** (page 53).

Does Sound Travel?

This activity demonstrates how sound travels through the air once it is produced. The sound vibrations can be transmitted from one place to another, or from one object to another.



Where Does Sound Come From?

Name: _____

Worksheet



you'll need:

- drum and drumstick
- salt
- balloon
- whistle



what to do

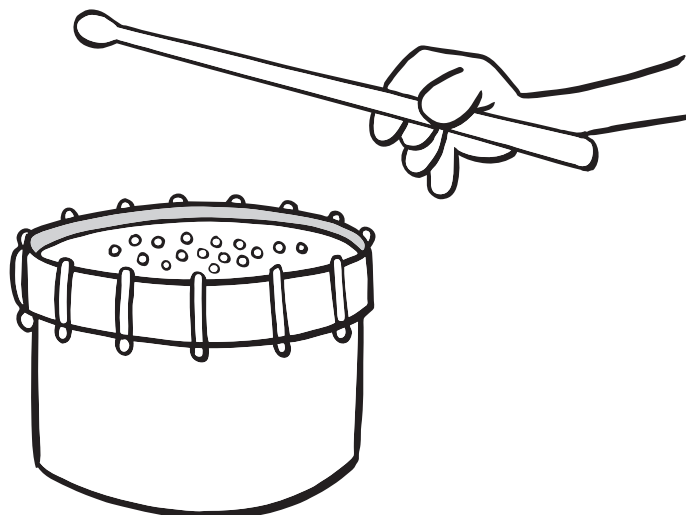
Vibrations produce sound.

1. Sprinkle the salt on the drum.
2. Hit the drum with the drumstick.



observe

What happens to the salt?





Where Does Sound Come From?

Name: _____

Worksheet



Blowing air produces sound.

1. Blow in the whistle.

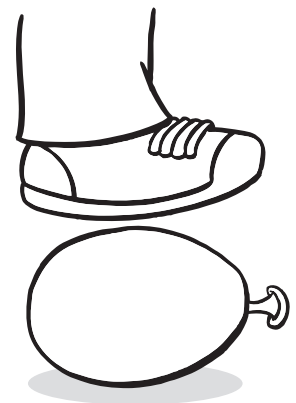


What happens?



Explosions produce sound.

1. Blow up the balloon.
2. Pop the balloon with your foot.



What do you hear?



Where Does Sound Come from?

Name: _____

Worksheet



What did you discover? Three ways to produce sound! Draw a picture of each one:

Vibration creates sound

Explosions produce sound

Blowing air produces sound



Name: _____

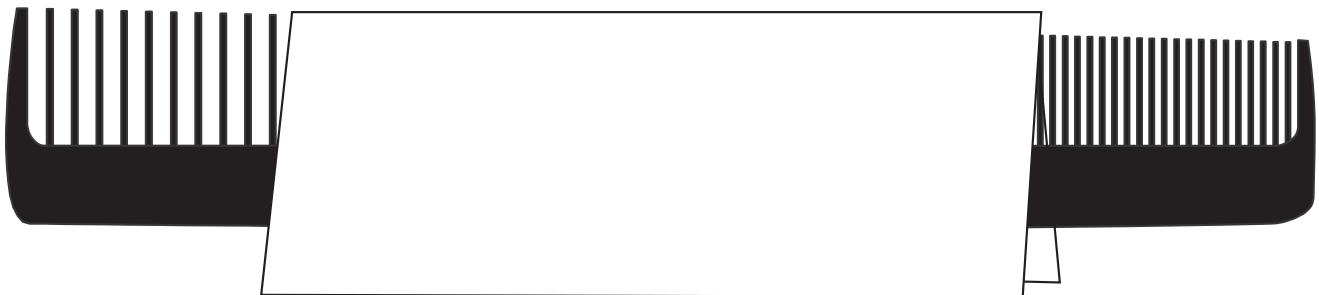
Make A Kazoo



- plastic comb
- about 3 in. x 2 in. (10 cm x 5 cm) of each:
 - ☐ wax paper
 - ☐ newspaper
 - ☐ plastic bag
 - ☐ tissue paper



1. Pick a material and fold it over the middle of the comb.
2. Place your mouth over the paper on the toothed side.
3. Hum into the paper (like you would hum into a kazoo).
4. Try the other materials.
5. Answer the questions on the worksheet.





Name: _____

Make a Kazoo

Worksheet



What will happen when you hum into the comb?



What happened when you hummed into the comb?

Which material made the loudest noise?

Which material made the softest noise?



Circle the right answer:

The kazoo makes sounds because the material :

screams

vibrates

rolls up

How did the different materials change the sound of the kazoo?



Name: _____

Does Sound Travel?



- two identical glasses
- jug of water



1. Fill one glass halfway with water.
2. Dip your finger in the water.
3. Rub the rim of the glass with your finger.
Go around and around.



1. What do you hear? _____

2. What do you see? _____



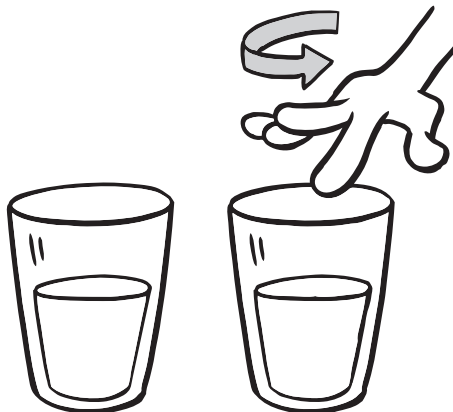
Name: _____

Does Sound Travel?



Part 2:

4. Place the second glass about 4 in. (10 cm) away from the first glass. Fill the second glass halfway (exactly like the first glass).
5. Dip your finger in the water.
6. Rub the rim of the first glass with your finger. Go around and around.



Does the second glass make a sound? _____

What do you see in the second glass? _____

True or false? Vibrations and sound go together _____



Name: _____

Does Sound Travel?

Worksheet

Draw a picture of the two glasses of water.
Draw your finger rubbing the first glass.

Your finger makes the first glass vibrate. It produces a sound. This sound travels through the air. It makes the second glass vibrate. Because of this, the second glass also makes a sound.

In your picture above, draw an arrow in the direction the sound is traveling.



How Does Sound Travel?

Name: _____



- Slinky™ toy
- a friend



1. Sit on the ground.
2. Ask your friend to sit in front of you.
3. Stretch the Slinky™ between you, on the ground.
Each person holds one end.
4. Swing the Slinky™ from side to side while your friend holds his end still.



What happens to the Slinky™ at your friend's end?



How is this like sound? _____

The vibration travels from you to your friend.
This is how sound travels through the air.

Answer Key What Is Sound?

Where Does Sound Come From?

When you hit the drum, it vibrates, and the ball bounces around. A whistling sound happens when you blow on the whistle. There is a popping sound when you step on the balloon. Pictures should represent the experiment (drum, whistling, balloon popping) and ideally show the mechanism by which sound is produced in each case (vibration, blowing air, explosion).

Make A Kazoo

The kazoo makes sounds because the material vibrates. Answers will vary. Materials that vibrate work best.

Does Sound Travel?

1. A humming noise. 2. Ripples in the water. 3. Yes, the second glass makes the same sound as the first glass. 4. There are ripples in the water of the second glass. 5. TRUE, vibration and sound go together. 6. Draw a picture of the two glasses with water: picture should represent the experiment. The arrow should go from the first to the second glass.

How Does Sound Travel?

The Slinky™ goes from side to side too.