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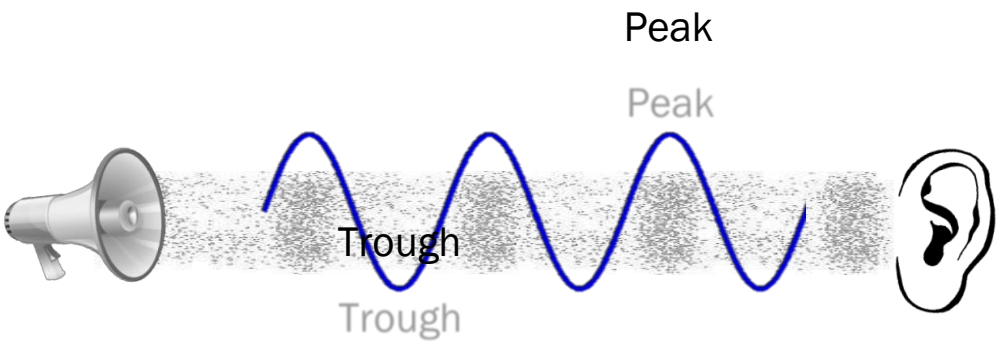
Background Information:

Living organisms reproduce offspring and go through life cycles. Some offspring may look similar to their parents, while others look very dissimilar to theirs. Immature organisms that look similar to their parents will share some, but not all traits with their parents. This may be observed in many types of plants and animals. Examining the similarities and differences assists in identification, grouping, and classification.

Many organisms have the ability to communicate with sound. Sound allows organisms to learn more about their surroundings. Sirens, ringing of phones, musical instruments, animal sounds, and the human voice are a few examples of using sound to communicate. Sound is produced when an object vibrates. As demonstrated in the diagram below, the vibrations cause the medium's particles, usually air, to displace and allow the sound to travel in a singular direction.[1] This longitudinal movement dictates the volume in which sound is heard; standing in the path of the longitudinal wave increases the probability, thus the volume, of hearing the emitted noise. This concept explains why it is difficult to hear sounds when positioned behind the source. A vibrating object makes sound, however sound also makes an object vibrate.



Light is needed for humans to see. Light may also be used to communicate. As with sound, the type of medium used for passing the light through will be determined by the function of the communication. For example materials used in stoplights, stained glass windows, flashlights, and frosted glass all affect the output of light. When light strikes an object, many actions may occur. Two

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factors involved in this interaction are the type of light and the object itself. The light may bounce or reflect off of an object or pass through it. The quality of light transmission may determine the use of a material.

If the light passes through an object, the object is said to be transparent. These materials absorb one or more frequencies of light and transmit what is not absorbed. Examples of transparent items include plastic wrap, soap bubbles, clear glass, and some plastics.

Objects that do not allow light to pass through them are called opaque. Opaque objects cannot be seen through. Opaque objects absorb one or more frequencies of light and reflect what is not absorbed. Quarters, rubber, and bricks block light, thus they are opaque.

Translucent objects allow light to pass through them; however, the light is scattered as it passes through the objects. The details of translucent objects cannot be clearly seen. Translucent items include wax paper, frosted glass, some plastics, and tissue paper.

Resources:

1. http://www.ducksters.com/science/physics/sound_wave_characteristics.php (longitudinal wave picture included)

Activity: Animal Match - Young versus Adult

1-LS3-1 Heredity: Inheritance and Variation of Traits
Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

Objectives:

- Students will work cooperatively to identify similarities and differences between immature and mature organisms.

Advanced Preparation:

- □ Determine group size for similarities and differences drawing

Materials:

- 7 Sets Animal Matching Cards
- Same Different Student Page

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Suggested Approach:
You may wish to begin by hosting a class discussion around these ideas:

- ☆ *What types of baby or young animals have you seen?*
- ☆ *What types of baby or young plants have you seen?*
- ☆ *Share with us how they looked.*

Explain to the students they will now have a chance to look at cards that have pictures of babies and pictures of their parents. Their task is to match the young animal or plant with the grown-up animal or plant. Distribute a set of pictures to each group of four students. Allow ample time for this to occur. Once all of the groups are done, you may wish to have a gallery walk so they are able to view other group's ideas. Students then return to their original groups. Rearrangement of pairs, based on any observations or conversations during the gallery walk, may occur. Encourage groups to discuss similarities as well as differences among the immature and the mature organisms.

Using your decision as to group size, have pairs of students select their favorite animal or plant. Next distribute the Same Different student page, one per group.

Student pairs will complete the following:

- ☆ *Write the name of the animal or plant they selected at the top of the page.*
- ☆ *List, draw, or write traits that are the same and different in the appropriate part of the student page.*

Debrief:

- ☑ *Have groups share their ideas about their favorite animal or plant.*
- ☑ *How babies or young the same as the grownup?*
- ☑ *How are babies or young different than the grownup?*
- ☑ *Tell us about your idea.*
- ☑ *Why do you think this happens?*

Activity: Seedlings

1-LS3-1 Heredity: Inheritance and Variation of Traits
Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.

Objectives:

- ➢ Students will observe seeds as they grow.

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- Students will identify similarities and differences between immature and mature organisms.

Advanced Preparation:

- □ Decide when and how the student journal pages will be distributed, completed, and bound.
- □ Decide when students will design their journal cover
- □ Determine how and where seeds will be grown and stored throughout the exploration.
- □ Note: Paper plates are provided in the materials. Alternately you could use plastic zipper baggies.
- □ Gather paper towels.
- □ Make a watering plan. The frequency and amount of water will vary depending upon the classroom conditions.

Materials: (Students work in pairs or groups of four.)

- Seedling Journal Student Pages
- Radish Seeds (Group size will determine the number of seeds per group.)
- Paper Plates
- Paper Towels
- Hand Lenses
- Cup
- Water
- Soil – *for transplanting seedlings - optional*
- Containers – *for transplanting seedlings - optional*

Suggested Approach:

Students will develop a journal throughout this activity.

- ☆ *Journal Cover:* Complete according to your decision.
- ☆ *Seed Observation Journal Page:* Distribute radish seeds and hand lenses so students may begin by observing the seeds. Encourage students to share their observations with one another as they work. Provide the Seed Observation Journal page for recoding of observations. Encourage use of both drawings and words in the journal.
- ☆ *What I Did Journal Page:* Ask students what seeds need to grow. You may wish to have them write their ideas. Share your plan regarding how students will grow the seeds. Students complete this page with planting details.

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Plan for growing the seeds

- ☆ *On This Day Journal Page:* Students will record both the day of and their observations. It is suggested a new page is used for each day. A copy of this page is needed for each observation day.
- ☆ *What I Learned Journal Page:* At the conclusion of the exploration students will explain what they learned about the "stages" of radish seed growth. Using drawings, diagrams, arrows, and words are encouraged.

Students may read, compare, and discuss their journals with each other.

Debrief:

- ☑ *What did the seeds look like when you first saw them?*
- ☑ *Did the seeds look the same or different than each other?*
- ☑ *Did the seeds look the same or different while they were growing?*
- ☑ *How did the seedlings look the same as each other?*
- ☑ *How did the seedlings look different than each other?*
- ☑ *When the seeds were growing, did they look the same or different than a full grown plant?*
- ☑ *When did the seeds look like a full grown plant?*
- ☑ *Note: If the seeds did not grow completely, you may wish to use the Seedling power point for the discussion.*

Activity: What's That Sound?

1-PS4-4 Waves and Their Applications in Technologies for Information Transfer

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

Objectives:

- ➢ Students will identify multiple sounds.
- ➢ Students will explain the reason for various sounds.

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- Students will determine relative distance that sounds travels.

Materials:

- 2 sets of *What's That Sound* Cards
- Game Tokens – *such as macaroni noodles, cm cubes*
- Computer with Speakers
- *What's That Sound?* power point

Suggested Approach:

Review your rules of how to play the Sound Game. Distribute a card to each student. Play the *What's That Sound?* ppt. When you have gone through the entire power point, or longer if you wish, hold a discussion. Students may share their ideas about descriptions of sounds, their favorite sounds, and how they think sound works.

Debrief:

- ☑ *What is the purpose of each sound?*
  - *Why did the horn honk?*
  - *Why did the cat meow?*
  - *Why did the bird squawk?*
- ☑ *Where do you need to be to hear the sound?*
- ☑ *Can you hear the_____when you are close to it?*
- ☑ *Can you hear the_____when you are far away from it?*

Activity: Join the Band

1-PS4-1 Waves and Their Applications in Technologies for Information Transfer

Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

1-PS4-4 Waves and Their Applications in Technologies for Information Transfer

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

Objectives:

- Students will explore how to play various percussion instruments.
- Students will explain how the instruments make sound.

Advanced preparation:

- □ Determine locations of stations.

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Materials:

- Join the Band Student Page
- Tambourine
- Sand Egg
- Triangle
- Castanet
- Tuning Fork
- Bells
- Rhythm Sticks
- Sound Shape
- Cymbal

Suggested Approach:
Set up stations around the room. A different type of instrument will be at each station. Distribute student pages and provide any needed directions. Divide the class into groups. Each group will visit each station. Allow plenty of time for exploration of how to play the instrument and observations about it. Students may record their information on their Join the Band Pages.

Debrief:

- ☑ *What did you hear when you played the instruments?*
- ☑ *What did you notice about the instruments?*
- ☑ *What did you see?*
- ☑ *How do think they work?*
- ☑ *Were other people able to hear the instruments?*
- ☑ *Why do you think other people could hear the instruments?*

Activity: Salty

1-PS4-1 Waves and Their Applications in Technologies for Information Transfer
Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Objectives:

- Students will visualize and explain the relationship between sound and particle movement.

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Advanced Preparation:

- □ Cut around the edges of baggies. These will be held taught to the top of
- □ the cup with a rubber band.
- □ Determine who will attach plastic to top of cups with rubber bands.

Materials:

- 1 Cup per Group
- 2 Salt Packets per Group
- Tuning Fork
- 1 Quart Plastic Bag per Group (Use the piece of the bag that does not have a label on it.)
- 1 Rubber Band per Group
- Hand Lenses
- Other materials to test – Ensure they will vibrate and not stick to the plastic. (optional)
- Coloring Supplies
- Drawing Paper or Whiteboard

Suggested Approach:

Begin by having students share what they noticed about the instruments from the previous lesson. Distribute the tuning forks among the groups. Encourage groups to discover how to use a tuning fork. Discuss as a large group their ideas. If needed, demonstrate how to use a tuning fork.

Provide a cup to each group or plastic covered (refer to your advanced planning decision). Each group will need a packet of salt. Students then pour a packet of salt on top of the plastic. Allow time for students to observe with hand lenses and share with one another what happened. Chart their observations.

Distribute the tuning forks. Again, allow ample exploration time for using the tuning fork and the results of touching the tuning fork to the plastic covering. Elicit and chart their observations. (Note: You may wish to have the materials available for the discussions so students may connect experiences to the discussion.) Following are questions to guide a class discussion:

- ☆ *How did the salt act/behave when the tuning fork touched the covering?*
- ☆ *What are some words we could use to describe this? (bounce, dance, jump, move…)*
- ☆ *What else did you notice?*

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- ☆ *Was this the same or different than when you didn't use the tuning fork?*
- ☆ *Share what you saw.*
- ☆ *What do think is needed for sound to happen?*
- ☆ *What is made when vibrations happen?*

Provide a whiteboard/paper to either pairs or groups of four. Now they will describe how sound happens. Again encourage words, drawings, and diagrams. Groups then share and explain their ideas.

Debrief:

- ☑ What do you think the vibrations cause?
- ☑ What do you think the sound causes?
- ☑ Can there be sound without vibrations? Use evidence to explain your idea.

Activity: Can You See It?

1-PS4-3 Waves and Their Applications in Technologies for Information Transfer

Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light.

Objectives:

- ➢ Students will investigate a kaleidoscope.
- ➢ Students will explore the quality of light transmission of various objects.
- ➢ Students will use design and build a kaleidoscope based on material's attributes of light transmission.

Advanced Preparation:

- □ Cut tissue paper, aluminum foil, transparencies, and any other materials into squares.

Materials: (Students will work in 3 groups for the initial investigation of the kaleidoscopes.)

- Kaleidoscopes
- Flashlights
- Origami Paper, Assorted Colors
- Tissue Paper, Assorted Colors
- Aluminum Foil

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- Transparencies

Suggested Approach:
Begin by distributing one kaleidoscope per group. Allow ample time for students to use the kaleidoscopes, make observations, and share ideas within their groups. As a large group, elicit observations, comments, and ideas students wish to share. You may wish to record these for reference through the rest of the lesson.

Share with students that they will continue to explore light. Provide students with flashlights and samples of solid color paper (origami paper), tissue paper, transparencies, and aluminum foil. Pose a question such as, "What happens when you shine the flashlight at the papers?" Explain to students that this is the question they need to investigate. Have student groups of four investigate light transmission through the various samples. Assist student groups as needed. Based on their observations, students now group the papers into categories.

Host a class discussion with questions such as the following:

- ☆ *Did all of the paper let the light through?*
- ☆ *What differences did you notice?*

Students return to their original groups and resort their papers, if they wish, based on the discussion. You may wish to coach them to the categories of light goes all the way through, partly through, not through, and bounces back.

Distribute a set of Light Student Pages to each student. Students continue to work with their groups and retest materials as needed. Each group will select a type of paper used and explain how the light interacts with it, as well as a potential use for the paper. It is suggested this is done three to four times, each time with a different type of paper.

Ask each group to complete the following. In your group, think of other objects that use one or more of these properties of light. Once they have completed their discussions, have them share ideas. You may wish to chart their ideas under the following headings:

Passes Through	**Does Not Pass Through**	**Bounces Off or Reflects**

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Debrief:

- ☑ Brainstorm items that purposefully use these traits.
- ☑ Explain your ideas.

Activity: Build It!

1-PS4-4 Waves and Their Applications in Technologies for Information Transfer

Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.

K-2-ETS1-1 Engineering Design

Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Objectives:

- ➢ Students will apply knowledge of light transmission to construct a kaleidoscope.
- ➢ Students will explain why the chosen materials are used in the construction process.
- ➢ Students will follow a series of steps.
- ➢ Students will work collaboratively to diagram how a kaleidoscope works.

Advanced Preparation:

- □ How will materials be distributed?

Materials:

- Translucent Beads (About 10 per student)
- Cups
- Transparent Tape
- Cardstock
- Aluminum Foil
- Glue Stick (optional)

Suggested Approach:

Begin with a discussion about the results from the previous lesson and the initial investigation of the kaleidoscopes. The following are some questions that may support the conversation:

- ☆ *Which material(s) did the light shine through?*

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- ☆ *Do you think this happened when you used the kaleidoscope? What is your evidence?*
- ☆ *Which material(s) did the light not shine through?*
- ☆ *Do you think this happened when you used the kaleidoscope? What is your evidence?*
- ☆ *Reflection of light was caused by what material(s)?*
- ☆ *Do you think this happened when you used the kaleidoscope? What is your evidence?*
- ☆ *What is the purpose of a kaleidoscope?*

Share that they will now make a kaleidoscope. Introduce the materials that will be available for students to use. Student groups should plan how to build the kaleidoscope. Once plans have been developed, have students obtain materials. Assist students as needed during the building process.

Once the kaleidoscopes are completed, allow time for students to view theirs as well as other students' creations. Divide students into groups no larger than four. Supply each group with a piece of drawing paper or a whiteboard. Each group now explains how the kaleidoscope works through the use of drawings, labels, arrows, and such. Student groups can then share their ideas with the class. Combine their ideas to arrive at the correct explanation by having a class discussion. Have the groups return to their explanations and redo or revise as needed.

Debrief:

- ☑ Discuss the following questions:
- ☑ Why were clear cups used?
- ☑ Why did we use beads that the light can pass through?
- ☑ What happens when light hits aluminum foil?
- ☑ How did this help make the kaleidoscope work?
- ☑ If someone asked you what light could do when it his (shines on) different materials, what would you tell them?