Echolocation Activity Instructions

Level 2

ease of implementation: fairy easy

OVERVIEW

Students alternate making noises into the air or into large objects placed in front of their faces to simulate echolocation.

Why It's Easy for You

- Only one supply item needed.
- No mess.

Before You Begin

- You can use this activity as lead- in to learn about echolocation, or students can learn about echolocation prior to this activity
- Consider how to collect supplies..

Conditions and Challenges

- Students should not share supplies with current distancing restrictions. Each student will need their own large bowl or box, (but see "alternative materials" below).
- Activity is noisy.

NGSS alignment

We have this activity up as part of a series of lessons focused around bats and standard:

1-LS1-1 : Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

This activity can also be used as part of many standards related to sound and animals including:

1-PS4-1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.

Disciplinary Core Ideas

- NGSS writes that students should learn "Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive." (This is in the general NGSS category of "information processing.") In this lesson students learn that many species of bats rely on sound as much as humans rely on sight! Bats can use sound to determine where objects and potential food are located.

Crosscutting Concepts

- Different crosscutting concepts are relevant, depending on how you choose to focus the lesson. You might talk about Cause and Effect, explaining how sound waves hitting an object (cause) can cause those sound waves to bounce back to their source (effect). Alternatively, you could discuss System and System Models to explain how echolocation serves as a model system including the bat, the generated sound waves, and the object (or lack of) in front of the bat.

Scientific Practices

- Developing and Using Models: In this activity, students are modeling echolocation in order to understand it better. We recommend explicitly discussing with students that they are going to "model" this bat behavior! Students can discuss the similarities and differences of their experience modeling echolocation and bat echolocation.

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Scientific Practices (cont)

- Analyzing and Interpreting Data: This activity falls under the following aspect of this SEP, from NGSS: "Use observations to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems." While students are not recording data, they should be guided to make the connection between their observations (i.e. the sounds they make sound different with and without a bowl in front of their face) and bat echolocation. This knowledge can be helpful in understand echolocating canes and watches, and possibly help them design their own bat invention.

Materials

- One box or large bowl per student. The item should be bigger than their head.

Alternate materials

- Any item with a large surface area, preferably curved. Taping two pieces of 8.5 x 11'' paper together can work in a pinch!

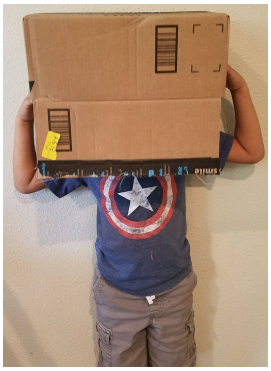
Teaching the Lesson

1. Determine how you will gather supplies for the students. For sanitary reasons, each student should get their own bowl/box (alternatively, you could disinfect supplies between uses), and this should be done outside or near an open door. If it is challenging to get enough supplies in the classroom, this could be a good homework assignment.

2. Test the steps prior to teaching! (see below)

3. (Optional) Have students write down predictions of whether they think the sounds they make will sound different with an object in front of their face vs. no object.

4. Once you are with the students, model the following steps:
A. Say "ahhhhh" fairly loudly, with nothing in front of your face. Pay attention to how it sounds.
B. While still saying "ahhhhh," move the bowl or box in front of your face. Does it sound different? If not, try moving the item closer to your face.
C. Move the item down and away from your face, does the sound change?



5. Have one or two students at a time try out the activity. If this is too challenging to take turns in the classroom, consider assigning this for an at-home activity (take-home instructions are provided).

6. Guide students in the discussion to determine *why* things sounded different with the bowl/box in front of their faces. Where are the sound waves traveling?

7. After each student has had their turn (or did the activity at home), have them write on a piece of paper or in their science journals if the sounds were noticeably different with and without the object in front of their face and why. Have them connect this to bat echolocation.

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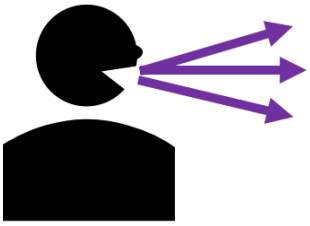
Model (simplified)

No object in front of face

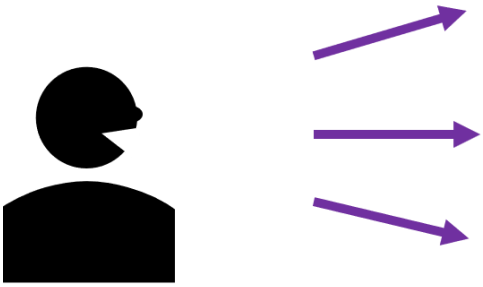
With no object in front of the face, sound waves will continue to travel in straight lines.

(Note: Sound waves initially travel in all directions, including behind the head! However, for simplicity, we only show sound waves going in front of the face below.

1. Sound waves (shown as arrows) leave the mouth



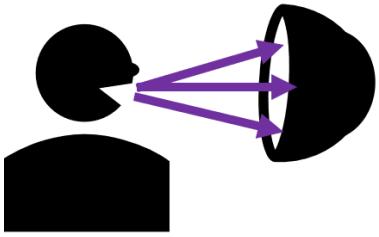
2. Sound waves continue forward unobstructed



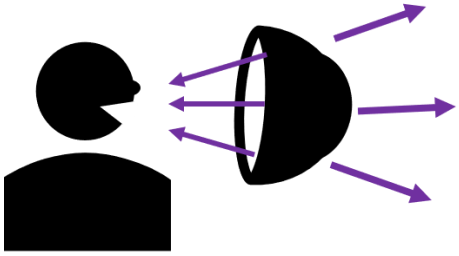
Object in front of face

A bowl/box/object in front of the face will cause some of the sound waves to change direction and go back toward the source. This creates an echo effect, similar to echolocation.

1. Sound waves (shown as arrows) leave the mouth



2. Some of the sound waves echo back after hitting the bowl, changing your perception of the sound



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