

Physics of Sound

Physics of Sound > Investigation 1: *Dropping In* >

Part 1: *Drop Challenge*, page 8

Outdoor Sounds

Boston Schoolyard Initiative Extension

When to Go Out

Following Part 1 and again later in the module, take students outside to listen for sounds.

Outdoor Objective

Students will practice sound discrimination in a different environment and increase their vocabulary for describing the properties of sounds. Students become more aware of the sounds all around them and how much information those sounds provide.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
	1 Blindfold (optional)
For the Teacher	1 Watch or stopwatch

Getting Ready

Time: 10–20 min.

Site: Select an area that is conducive to sitting still and listening.

Caution: Tell students you will keep your eyes open if it will help them relax and feel safe closing their eyes to listen.

Seasonal Tip: In cold weather, do this activity as a “sound walk.”

Guiding the Investigation

1. After reading, “‘Seeing’ the World through Sound” in *FOSS Science Stories: Physics of Sound*, review the types of sounds you have been exploring in class. Ask, *What sounds might we hear outdoors? How will outdoor sounds be different?*
2. Have students set up a T-Chart in their notebooks labeled “Sounds” and “Properties” and then ask them to list sounds they predict they will hear outdoors. Explain that the class will be sitting and listening silently outside to hear as many sounds as possible.

Outdoor Activities At a Glance

Investigation 1

Outdoor Sounds (BSI Extension)

Sounds of Schoolyard Wildlife (BSI Extension)

Quietest and Noisiest Outdoor Locations

(FOSS® Home/School Connection)

Investigation 2

Listening for Pitch Outdoors (BSI Extension)

Part 2: Length and Pitch Outside

Investigation 3

Sounds through Solids Outside (BSI Extension)

Observe the Speed of Sound through Air (FOSS® Extension)

Priority activities appear in **green**.

What You Might Find:

Two minutes may feel like a long time for students. Try to give students the full two minutes without rushing it.

Outdoor sounds may be louder or further away than indoor sounds. Students may require a different kind of listening since you often cannot see the object making a sound.

“My kids enjoyed listening to all the sounds outside. They ‘tuned’ in right away to the more obvious noises like the trucks and sirens. But, as we listened more closely, we heard noises of birds fluttering and working.”

Mark Walter
Science Specialist

- Take students outside and help them settle in before beginning a silent “two-minute listen.” Try not to rush this activity. It will take a little while for students to get past the most obvious sounds, to those that are more subtle or unfamiliar.
- After two minutes, have students record the sounds and the properties of the sounds they heard in their science notebooks. Encourage them to be quiet and continue listening while they are writing.
- When time is up, share discoveries and observations. Ask if students heard the sounds they had predicted they would hear. Ask, *Was it always possible to tell what was making the sound? What do the sounds we are hearing tell us about what is happening in the neighborhood?* Ask students what they experienced as well as what they heard.
- Listen together to a sound and describe its properties. Did different students use the same or different words to describe the same sound? Ask, *Does a nearby car sound the same as one far away? Do all birds sound the same?*
- Add new words or ideas from this experience to the classroom word bank or content/inquiry chart.

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Part 3: *Sound and Vibrations*, page 21

Sounds of Schoolyard Wildlife

Boston Schoolyard Initiative Extension

When to Go Out

Following Part 3, take students outside to listen for animal sounds.

Outdoor Objective

Students will improve their sound discrimination skills, and increase their awareness of animals in and around the schoolyard. Students will better understand that animals use sound to communicate information.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil
For the Class	Binoculars (optional)

Getting Ready

Time: 10–20 min.

Site: Select an area with minimal conflicting noise, where wildlife is likely to be most evident. A field trip to a nearby park may be worthwhile.

Guiding the Investigation

1. After reading “Animal Babble” in *FOSS Science Stories: Physics of Sound*, ask, *What wildlife do you think we might see or hear in the schoolyard? What information about an animal do you think we might be able to tell by the sounds we hear? How big it is? What it is doing?*
2. Have students set up their notebooks so they can record the animals they see, the animals they hear, and the properties of those animal sounds.
3. Discuss how students should behave, so that they don’t scare animals away. Ask, *How will the animals know we are there? (From the noise we make!)* Ask students where they think the class is most likely to hear animal sounds and try out the areas they suggest.
4. Ask students to be silent for two minutes, and then record the wildlife they see and hear in their science notebooks.
5. Quietly prompt students with questions from time to time. Ask, *Do you hear animals that you cannot see? Can you tell what the animals are doing from the sounds you hear? Can the animals hear us? How do you know? Do you see any animals that you do not hear? Why can’t you hear this animal? What information do you think these animals are communicating by the sounds we are hearing?*
6. Add new words or ideas from this experience to the classroom word bank or content/inquiry chart.

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Part 3: *Sound and Vibrations*, page 21

Quietest and Noisiest Outdoor Locations

FOSS® Home/School Connection, page 32

When to Go Out

Following Part 3, take students outside to identify the quietest and noisiest locations in the schoolyard.

What You Might Find:

Birds are likely to be the most visible or audible animals from the schoolyard. Birds provide a good opportunity to compare the sounds different birds make (chirp, twitter, honk, caw); or different sounds made by the same bird.

Squirrels, insects, dogs, and cats are other common animals you may hear.

If you do not find a lot of wildlife in your urban schoolyard, talk about why not. The experience may make students more attentive to wildlife they do encounter.

Materials

For Each Student	Science notebook
	1 Clipboard
	1 Pencil

Getting Ready

Time: 10–15 min.

Site: Select a site conducive to sitting and listening.

Seasonal Tip: Different seasons bring different sounds. Notice which sounds are seasonal.

Guiding the Investigation

1. Tell students their task is to listen to sounds in the schoolyard and identify the pitch of each sound. Have students make a three-column table in their notebooks with “High/Medium/Low” written across the top.
2. Help students settle into a listening position outdoors. Listen to a few sounds as a class and discuss whether they are high, medium, or low in pitch. Give students a few minutes to just listen before they begin recording the sounds they hear and the pitch of each.
3. Discuss what students heard. Is there agreement about the pitch of each sound?
4. Add new words or ideas from this experience to the classroom word bank or content/inquiry chart.

Physics of Sound > Investigation 2: *Good Vibrations* >

Part 2: *Length and Pitch*, page 13

Length and Pitch Outside

When to Go Out

Conduct Part 2, Steps 4–9 outdoors to give students more space in which to investigate the four instruments. Refer to the FOSS Teacher Guide for complete instructions.

Outdoor Objective

Students will discover how length affects the pitch of an instrument. Students are better able to distinguish the direction sounds are coming from and the pitch of those sounds by working in a larger open space.

What You Might Find:

Students may hear differences in pitch between similar objects of different sizes including: birds, wind chimes, barking dogs, cars and trucks, construction tools, and/or people talking.

“My students needed the experience of hearing and identifying random outdoor everyday noises while determining if they have a high or low pitch. This practice trained their ears to listen for different sounds and helped them develop vocabulary to talk about these sounds.”

Mark Walter
Science Specialist

noisemakers instead of their voices in order to ensure that the volume of the sound produced remains constant.

3. Students will wait in line next to their partners while you set up the experiment. Pass out one noisemaker to each pair of students. Set the shortest phone on the ground close to the first two people in line. The four-meter phone will be about two meters away from the short one, also spread out on the ground. Continue this pattern until all six phones are unwound and stretched out on the ground (forming an upside-down pyramid shape).
4. When you are ready, have the first four students pick up the shortest phone and each side will take turns using their noisemaker. After each student has a turn being the sound source and the sound receiver, the partners will put the phone down on the ground and move on to the next longer phone. The second group will start with the shortest phone. It is important that students use the phones in order.
5. Have students try using noisemakers without the “phone” to compare the way sound travels through air.
6. Continue until all students have tried all of the phones twice.
7. Discuss observations and discoveries.
8. If students are waiting for their classmates to finish, they could sit back-to-back with their partner and listen for sounds and determine if they are high- or low-pitched sounds.

Physics of Sound > Investigation 3: *How Sound Travels* >

Part 2: *Sounds through Solids*, page 15

Observe the Speed of Sound through Air

FOSS® Extension, page 22

When to Go Out

Following Part 2, take students outside to measure the time it takes sound to travel from a distant point to an observer. Refer to the FOSS Teacher Guide for complete instructions.



Outdoor Objective

Using the larger distances available outdoors, students will conduct an experiment to measure the delay in time between when a sound is produced and when the sound waves reach the student observer.

Materials

For Each Pair	1 Stopwatch
For the Class	1 Metal garbage can lid or something that will be loud when struck

Getting Ready

Time: 30–40 min.

Site: You will need an open space with at least 200 meters of distance between the sound source and the sound receivers, about two football fields long.

Caution: Because of the distance between student groups, two or more adults are needed for this activity.