Sound Vibrations

1.1

Image via iStock.com/tylin

Anchoring Phenomenon

Emergency sirens make loud sounds.

Lesson Concept

Plan and conduct investigations and construct an explanation demonstrating that vibrating matter can cause sound.

Investigative Phenomenon

Instruments have parts that vibrate, causing sound.

Standards

Refer to Appendix 1.1 for NGSS, CCSS (ELA), and California ELD Standards.

Storyline Link

This is the first lesson out of a sequence of three. The lesson begins by connecting to the fact that people hear sounds every day by taking students on a sense walk and generating a list of things observed, specifically focusing on sounds heard. The anchoring phenomenon, the sound made by emergency sirens, is introduced in this lesson as one of the sounds that we hear or have heard before. As the lesson progresses, students are challenged to use instruments at given stations to make sound and figure out what causes the sound. During this time, you will model how to plan an investigation. The large take-away at the end of the lesson is that vibrating matter causes sound. This idea is built on during the next lesson, where students are challenged to construct devices that make loud sounds as a form of communication.

Throughout the lesson, a flag (▶) denotes formative assessment opportunities where you may change instruction in response to students' level of understanding and making sense of phenomena.

Time

230 minutes

Part I	45 minutes	(Engage)
Part II	45 minutes	(Explore 1)
	10 minutes	(Explain 1)
Part III	30 minutes	(Explore 2)
	10 minutes	(Explain 2 Part A)
Part IV	45 minutes	(Explain 2 Part B)
Part V	25 minutes	(Elaborate)
	20 minutes	(Evaluate)

Materials

Whole Class

- ❑ Emergency siren [example of table top siren (https://www.amazon.com/Onedayshop-Bicycle-Police-Trumpet-Cycling/dp/B013WGU4EK/ref=sr_1_15?rps=1&ie=UTF8&qid=1517194321&sr=8-15&keywords=siren&refinements=p_85%3A2470955011) or other siren of your choice; siren video (https://www.youtube.com/watch?v=6sFMnSNjVJQ) if needed]
- ❑ Chart paper
- ❑ Guitar video (https://www.youtube.com/watch?v=8YGQmV3NxMI)

Group

(See 1.1.R1: Instruments for Investigation Stations for directions)

- ❑ Kalimba
- ❑ Spoon gong
- ❑ Shoe box guitar
- ❑ Door fiddle
- ❑ Tuning fork
- ❑ Fishing line instrument
- ❑ Chart paper or large white board

Individual

- ❑ Science notebook

Teacher Use

- ❑ 1.1.R1: Instruments for Investigation Stations
- ❑ 1.1.R2: Performance Assessment Checklist

Advance Preparation

1. Walk around your school campus and map out a route for the sound walk activity.
2. Review the siren video. (https://www.youtube.com/watch?v=6sFMnSNjVJQ)
3. Prepare a T-chart, with What I Wonder on the left side and What I Found Out on the right. (Step 4 of Procedure)
4. Prepare a Question Words chart with *what, where, when, why,* and *how.* (Step 4 of Procedure)
5. Prepare a What I Think I Know chart. (Step 5 of Procedure)
6. Prepare an Investigation Planning chart. (Step 6 of Procedure)
7. Review **1.1.R1: Instruments for Investigation Stations**. Make the spoon gong, shoe box guitar, door fiddle, and fishing line instrument. Then organize the materials for the sound stations. (Putting materials for each station in a bin will make collection and cleanup easier to facilitate.)
8. Prepare **1.1.R2: Performance Assessment Checklist** by adding students' names. (Step 9 of Procedure)
9. Review the optional scaffolds for cause and effect on page 1.0.17 of the Introduction. Make a chart with the sentence frames to hang in the classroom. (Step 27 of Procedure)
10. Review the guitar video (https://www.youtube.com/watch?v=8YGQmV3NxMI) showing guitar strings vibrating.

Procedure

Part I

Engage (45 minutes)

Observe and describe what causes the sounds heard during a sound walk.

1. Ask students how we use our senses to make scientific observations. (If the concept of making scientific observations has not been introduced, spend a few minutes having a class discussion regarding how we use our senses to observe the world.) Take students on a walk around the school campus. Walk students through the cafeteria, playground, office, hallways, etc. Stop in at least four different locations and ask students to record their observations in their notebooks using drawings and words.

> **TEACHER NOTE**
>
> When you are on your sound walk, stop and allow time for students to listen to the different sounds. Ask students to stop and close their eyes so they may focus on sounds. If you have students who are hard of hearing or deaf, pair them with a student who can share what they are hearing through drawings.

2. Return to the classroom and ask students to share with a partner: "What senses did you use to make your observations?" Include a sentence frame as needed: I used my sense of _(hearing)_ to observe a _(bird)_. As a whole group, record a few student responses on chart paper, listing the four senses used (seeing, hearing, touching, smelling). Then ask for students to share out specific observations made, and record those on the chart under the corresponding sense used.
3. Ask students about other sounds they have heard. Ask if they heard any animal sounds and if they can identify what animal was making the sound. Have students share with a partner why they think animals make sounds (to communicate, such as birds and crickets). Create a list of other sounds, both at school and out in the community or in nature. This list should start to get students to think of sound as a larger concept that is a part of our lives and nature, but often not focused on. Tell students that you heard this interesting sound and you want to know if they can help you figure out what it is. Play the siren and a siren video. *If you have students who are hard of hearing or deaf, have them touch the siren as you play it*. Ask students about when, where, and why they may have heard that siren, and what they think causes the siren's sound. Have them think of questions they might have about the sound and chart them. Let students know that they will be learning how sirens work and what they are used for. Be aware that some students might display feelings of anxiety as they listen to a siren. If this is the case, provide an opportunity for students to express their feelings, and then explain that we will be learning how an ambulance siren works. (See Teacher Note below.) Let students know that their challenge will be to design a device that makes a loud noise that they can use in a pretend ambulance to drive safely through the streets if their siren is not working, and for this we first need to learn more about sound.

TEACHER NOTE

Watch for signs of discomfort or anxiety among your students in case some of them are mildly or severely disturbed by loud noises or have trauma related to sirens. Lower the volume or turn off the siren at the onset of any student's negative reaction. Also, make sure to warn your school colleagues that you will be using a siren so that others are not alarmed.

4. Transition the students to thinking about what things are similar or different about all the sounds that the class has heard or discussed. Have students share out with the class their ideas about sound. Draw a T-chart on chart paper with What I Wonder on the left and What I Found Out on the right. Have them think about the different sounds they heard outside and the sound of the siren (if they didn't hear a siren outside). Lead the class in a discussion about how, through asking questions, scientists can begin to think of investigations they can plan to answer their questions. Make a question words chart with students (what, where, when, why, how) and explain that almost all the question words in English start with the same two letters—*WH*—and that's why they are called WH-questions. Say, "We can use the word *what* to start a question, such as, What is …? What makes…? What would happen if …?" Encourage students to use the question words to ask what they wonder about sound and record their questions under What I Wonder. If no one brings it up, ask students "What causes sound?" and add it to the chart of questions. Have the class look back through the questions and see which ones would be something they could investigate in the classroom. For this first experience, choose the question, What causes sound? and set that question as the focus of what students will be investigating. You can introduce the question by saying, "We have developed a list of great questions to investigate. Today we will start with a question that will help us solve the problem of a broken-down ambulance siren. This one right here... [Point to the T-chart.] *What causes sound?* How many of you are wondering the exact same thing? In a few minutes we are going to use our sense of sight (seeing), feeling (touch), and hearing to investigate the answer to that question."
5. ▶ Have students share with their elbow partner what they *think* they know about what causes sound, even if they are not sure. Have students share with the class and chart their ideas. Use this activity as a pre-assessment of students' prior knowledge about sounds and what causes them.

TEACHER NOTE

nitially, students have a hard time with the concept (practice) of asking questions.

You can provide modified levels of support to students depending on their language needs with sentence frames.

For substantial prompting and support for emerging speakers:

Why is ___?

What does ___?

For minimal support for expanding and bridging speakers:

What would happen if ___?

What causes ___?

TEACHER NOTE (Continued)

You can also use use prompts and questions to elicit students to ask questions.

For emerging speakers:

Which of these questions are you wondering about?

Is your question (repeat what they said)?

For expanding and bridging speakers or for students who are knowledgeable of the topic and need to be encouraged to go deeper.

What questions do you have about (repeat what they said)?

What would be another question?

Procedure

Part II

Explore 1 (45 minutes)

Plan and conduct investigations to provide evidence that vibrating matter causes sound.

6. Lead the class in a think-aloud to collaboratively plan a science investigation.

   Ask students to identify the phenomenon and purpose of the investigation. After sufficient wait time, call on a few hands. Then explain that when we plan an investigation, we want to focus our thinking on the following three areas (chart these as you complete Step 6):

   i. the question that we are trying to answer (What causes sound?)

   ii. the materials that we are using (instruments: kalimba, spoon gong, shoe box guitar, door fiddle, tuning fork, fishing line instrument)

   iii. the data that we are collecting and how we are collecting it (drawing each instrument; use of labels or writing could also be added)

TEACHER NOTE

The purpose of collaboratively planning this investigation is to provide a progression in the use of this science and engineering practice (Planning and Carrying Out investigations). During Lesson 1.3: See Sounds, students will plan investigations with their groups and individually, so this lesson will lay the foundational work and the chart created in this lesson will serve as a reference and support during those investigations.

7. Ask students what questions came up after the sense walk (Step 4). Remind them that our question for today is, What causes sound? Show students the materials they will have access to for their investigation today. Hold up each item and ask students to identify it; support students with the unfamiliar items. Make a chart of the materials being used. Ask students to talk to their partner about what data they might collect while using these materials. Have students share out as a whole group and chart the data to be collected.

8. Explain to students that they will be working in groups of four to conduct this investigation. Refer to the plan and ask students what data they will collect as they visit each station. Clarify that at each station students will draw the object in their notebook and label what is making the sound. (There are six stations: kalimba, spoon gong, shoe box guitar, door fiddle, tuning fork, fishing line instrument.)

9. Set a timer for 10 minutes and instruct students to begin by trying to make a sound and then figuring out what causes the sound. Give an example by hitting a small drum or pot and asking what made the noise. Provide a sentence frame to help students frame their thinking: If ___, then ___. ▶ During this time, circulate around the stations. As they work, use **1.1.R2: Performance Assessment Checklist** to make quick notes on how students are doing in all three dimensions. (Later use Grade 1 Sounds Instructional Rubric on pages 1.0.14 and 1.0.15 of the Introduction to determine each student's level of understanding of DCI, CCC, and SEP at this point in time; you will do this again in Lessons 1.2 and 1.3.) As students explore, ask questions about what they see happening to cause a sound. Encourage students to use the sentence frame to explain the cause and effect relationship if they need this support.

> **TEACHER NOTE**
>
> ▶ As you assess students' performance with the SEPs using **1.1.R2: Performance Assessment Checklist**, you can refer to the Grade 1 Sounds Instructional Rubric on pages 1.0.14 and 1.0.15 of the Introduction to identify the level of students with respect to the three practices targeted, Grade 1 Sounds Instructional Rubric.

10. a. After 10 minutes, have students return all materials and rotate to their **second** station. Repeat Step 9.

    b. After 10 minutes, have students return all materials and rotate to their **third** station. Repeat Step 9.

> **TEACHER NOTE**
>
> At all stations, students should clearly see an object vibrating that is making the sound, although the word *vibrate* may not be familiar to or used by students. The use of the word *vibrate/vibration* is not an expectation at this time, just that they see the object moving back and forth to make sound. For hard of hearing or deaf students, have them touch the vibrating object, and explain that the vibrating object is producing sound, which they can feel, though not hear. In fact, all students would benefit from feeling the vibrations.

Explain 1 (10 minutes)

Construct an explanation that describes how vibrating matter causes sound.

11. As students return to their seats, remove all the station materials.
12. Have each student choose one station that they visited today, and look back at their notebook observation to think about what made sound and what caused that sound to be made. Again, refer to the sentence frame: If ___, then ___, or When ___, then ___.
13. Have students share with their elbow partner about their chosen station, verbally explaining what caused sound.
14. At this point, it would be a good place for you to review at least half of the students' notebooks and to look at the data that has been collected. Using sticky notes or some other removable paper, provide feedback to students about the quality of the data they are collecting. Through asking questions about their drawings or writing, you can often help students think more deeply about their data. Since the focus of this investigation is on developing the cause and effect relationship between vibrating matter and sound, ask questions specifically about how their drawing shows the cause of the sound they hear or feel.

TEACHER NOTE

When providing feedback to students in their notebook, the purpose is to help students deepen their thinking and not to penalize them. In that line of thought, feedback should be provided in a format that helps students revise or add to their notebook, not make them feel like they are wrong. Often through asking questions, you can help students think about their notebook in a different way. Feedback is best shared with students through writing questions on a sticky note or other removable paper, not writing directly in the student notebook.

Procedure

Part III

Explore 2 (30 minutes)

Plan and conduct investigations to provide evidence that vibrating matter causes sound.

15. Explain to students that they will be working in groups of four to follow their investigation plan for the remaining three sound stations today. Ask students what the question for our investigations was: What causes sound? Ask students what data we were collecting at each station: a drawing of what made sound and a determination of what causes the sound. At each station students will need to draw the object in their notebook and label what is making the sound. (There are six stations: kalimba, spoon gong, shoe box guitar, door fiddle, tuning fork, fishing line instrument.)

16. Set a timer for 10 minutes and instruct the students to begin by trying to make a sound and then figuring out what causes the sound. During this time, circulate around the stations. As students explore, ask questions about what they see or feel happening to cause a sound. Direct students' attention to the sentence frame that was used yesterday about the cause of the sound they hear or feel: If ___, then ___, or When ___, then ___. At all stations, students should clearly see or feel an object vibrating, causing the sound, although the word vibrate may not be familiar to or used by students. The use of the word *vibrate/vibration* is not an expectation at this time, just that they see the object moving back and forth causing sound.

17. a. After 10 minutes, have students return all materials and rotate to their second station. Repeat Step 16. Remind students to draw the object in their notebook and label what is making the sound.

    b. After 10 minutes, have students return all materials and rotate to the third station. Repeat Step 16. Remind students to draw the object in their notebook and label what is making the sound.

Explain 2 Part A (10 minutes)

Construct an explanation that describes how vibrating matter can cause sound.

18. As students return to their seats, remove all the station materials.

19. Have students choose one station that they visited today and look back at their notebook observation to think about what caused the sound.

20. Have students share with their elbow partner about their chosen station, verbally explaining what caused a sound to be made, again using the sentence frame about the cause of the sound they heard: If ___, then ___, or When ___, then ___.

21. At this point, it would be another good place for you to review the other half of the student notebooks and to look at the data that has been collected. Using sticky notes or some other removable paper, provide feedback to students about the quality of the data they are collecting. Through asking questions about their drawings or writing, you can often help students think more deeply about their data. Since the focus of this investigation is on developing the cause and effect relationship between vibrating matter and sound, ask questions specifically about how their drawing shows the cause of the sound they hear or feel.

TEACHER NOTE

Questions and comments can include things like "Use the science words in your answer." "Can you tell me why you think that?" "Label what is making the sound in your drawings." Pre-select common feedback from a few notebooks to share at the beginning of the next lesson.

For students who are still struggling with the concepts, or for those students who are able to demonstrate an advanced understanding of the concepts at this time (see the Grade 1 Sounds Instructional Rubric on pages 1.0.14–1.0.15 of the Introduction), you can refer to the Student Support Strategies on pages 1.0.16–1.0.18 of the Introduction.

Procedure

Part IV

Explain 2 Part B (45 minutes)

Construct an explanation that describes how vibrating matter causes sound.

22. Ask students to look back in their notebooks and find your feedback from the last session(s). Walk around helping them read the feedback, if needed, and then share the few common feedback comments you selected.

23. Ask students to look back in their notebooks and find the question they were investigating in the last session: What causes sound? Have students revisit each station by reviewing the data they collected. Have students review the feedback you provided and add to or revise their notebook entries as they feel necessary.

24. Assign each group one sound station. (Preferably each group would have a different station.) On a piece of chart paper or large whiteboard, have each group create a drawing of their given object, using labels and color to show what caused a sound to be made. Introduce the conventions of a scientific model (shows change or movement by using arrows, labels for the parts, clearly drawn, etc.). Have groups add the sentence frame to their chart: When ___, then ___. This relationship has been consistently referred to and used during this lesson explaining what caused sound that their instrument made.

25. Bring the class back together and have each group take turns presenting their assigned station. Start each group presentation by having them use the actual object to demonstrate what caused the sound to be made. Then have them present their model. Model and work together with students to create a graphic organizer on the whiteboard to record examples from the stations. Co-construct cause and effect statements that students can practice stating orally.

26. Ask students what kind of motions they observed (springing, stretching, wiggling, etc.). Show students that when you pluck (pull and let go) the rubber band it moves back and forth really fast. Tell students that this is called *vibration*. You can't always see vibration, but you can hear or feel it.

> **TEACHER NOTE**
>
> The goal of the presentations is for the students to identify that at each station, there was an object that was moving back and forth causing the sound they heard. If students have not used the word vibrate to describe the movement of the object, now would be the appropriate place to use the word to describe that movement.

Procedure

Part V

Elaborate (25 minutes)

Construct an explanation that describes how vibrating matter causes sound.

27. Once all the groups have presented, ask students the question from the beginning of the lesson sequence: What causes sound? Have students share their opinion (claims) about the relationship between vibrations and sound. Encourage them to talk about cause and effect relationships. Ask them how the investigations help them understand the cause of sound. (Optional scaffolds for cause and effect can be found on page 1.0.17 of the Introduction. These sentence frames can be made into a chart to display in the classroom.) The key understanding that we want to make sure the students have come to is that vibrating matter can make sound. At this point, it is appropriate to begin to ask students to further develop their use of the crosscutting concept cause and effect. Ask students if they observed any patterns among all the stations. Optional scaffold: A pattern I observed is ___. or I think this is a pattern because ___. Through a guided discussion, it should begin to become evident that vibrating matter causes sound and this pattern is repeated in every sound station they visited. Explain that identifying patterns in the natural and human designed world can be used to describe phenomena used as evidence to understand it.

28. Return to the anchoring phenomenon by playing the siren or siren video again. Ask students to predict what causes the sound of the siren using the data from their investigations. Revisit the T-chart with the list of questions from Steps 3 and 4 and discuss which questions have been answered. Record what they have found out under What I Found Out. Ask what other questions they might have and record these. Ask what they could do to find answers to their other questions. If it hasn't come up, ask the question of why sirens are so loud. Explain that they will be answering this question in the next lesson.

> **TEACHER NOTE**
>
> The goal of this conversation is for students to identify that at each station, there was an object that was vibrating causing the sound they heard. Students should use this idea when making their prediction about what causes the sound in the siren (anchoring phenomenon).

Evaluate (20 minutes)

Construct an explanation that describes how vibrating matter causes sound.

29. Play the guitar video showing guitar strings vibrating.

30. Pose the question: What causes the guitar's sound? Have students respond to this question in their notebook.

TEACHER NOTE

▶ For formative assessment, collect the notebooks at the end of the session.

Expected student response:

Students describe in words or drawings their observations that provide evidence for that claim (e.g., the guitar string vibrated and caused sound, or the sound is caused by vibrations).

Provide differentiated support to students based on their needs, such as: The guitar string ___ and made ___. or The ___ caused the ___.

Use the Grade 1 Sounds Instructional Rubric on pages 1.0.14–1.0.15 of the Introduction to assess students' understanding, and record your observations on **1.1.R2: Performance Assessment Checklist**. Refer to the Science and Engineering Practices for K–2 on pages 1.0.12–1.0.13 of the Introduction to view expectations for this grade. If the notebooks show that some students do not understand the concept of vibration, next steps can include the following:

Set up a center with some of the materials where students can continue to explore their ideas and refine their thinking. You might try to pair students so that a student who understands the concept well works with another student who needs some help.

Reteach the concept with a small group using a modified investigation in which students can work with the concept again in a different context.

In addition, use the Student Support Strategies on pages 1.0.16–1.0.18 of the Introduction for more reteaching strategies.

References

Brotheroff. (2016, July 30). Guitar Strings Oscillating in HD 60 fps. Retrieved May 16, 2020, from https://www.youtube.com/watch?v=8YGQmV3NxMI

fmartinjr. (2017, July 25). Ambulance siren Whelen PowerCall. Retrieved May 16, 2020, from https://www.youtube.com/watch?v=6sFMnSNjVJQ

Toolbox Table of Contents

Instruments for Investigation Stations

1. Kalimba

Materials:

- ❑ Purchase a kalimba.

Image by Gizlog via Wikimedia Commons [CC BY-SA 3.0]

Instructions:

1. Pluck the metal pieces to hear the sound.

Instruments for Investigation Stations

2. Spoon Gong

Materials:

- ❑ A large metal spoon
- ❑ Approximately four feet of string, yarn, or twine
- ❑ Scissors
- ❑ A ruler

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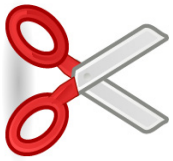

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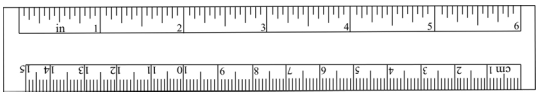

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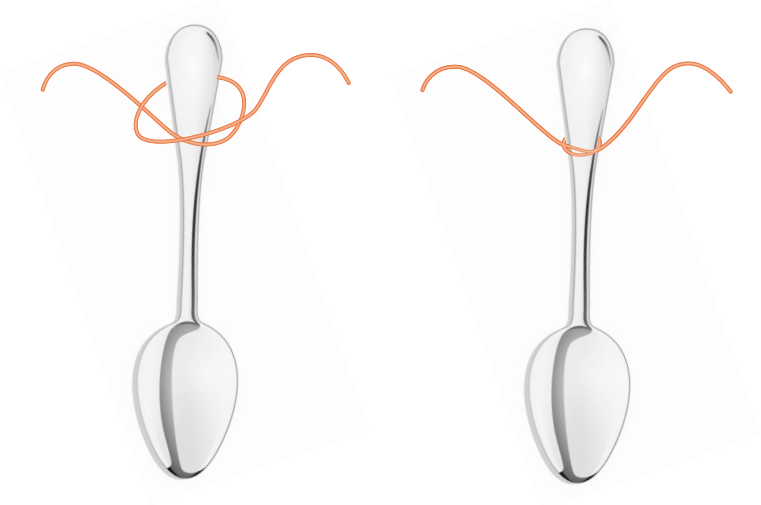
Instructions:

1. Use the ruler and the scissors to cut four feet of string.
2. Tie the piece of string to the handle of a big metal spoon by making a loop in the middle of the string and inserting the handle of the spoon into the loop.
3. Pull it tight so that the spoon hangs in the center of the length of the string.
4. Wrap each end of the string around the pointer finger on each hand, and press the string against each ear with your fingers.
5. Once the string is in place near your ears, the spoon should hang just below your waist.
6. With the spoon hanging from the string in front of you, bend over and lightly swing the spoon into the side of a desk, or have someone gently tap the large part of the spoon with a ruler to hear the "gong" sound.



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Instruments for Investigation Stations

3. Shoe Box Guitar

Materials:

- ❑ Shoebox
- ❑ Scissors
- ❑ Five rubber bands in different sizes
- ❑ Cardboard tube from a paper towel roll

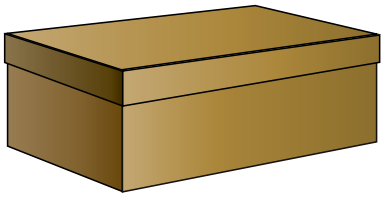

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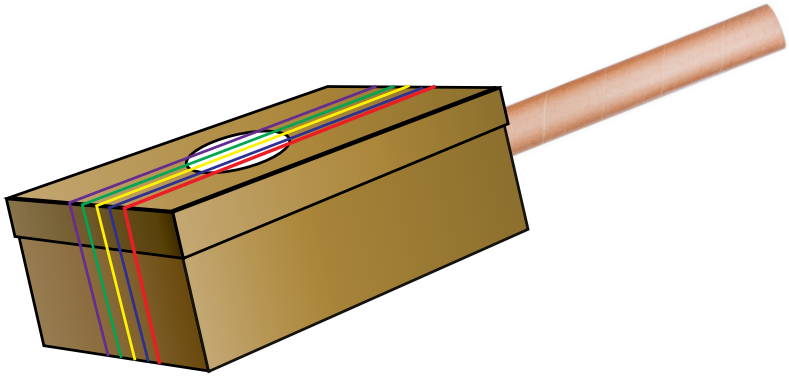
Image via Freepik.com

Instructions:

1. Use a cup or mug to trace a circle in the center of a shoebox lid.
2. Cut out the circle you just traced.
3. Stretch the rubber bands around the box so that they are stretched over the hole. The different-sized rubber bands will produce different notes.
4. Attach the cardboard tube from a paper towel roll to the top of the box to hold onto if desired.



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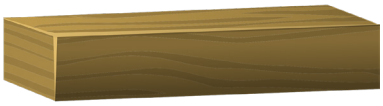
Instruments for Investigation Stations

4. Door Fiddle

Materials:

- ❑ Approx. 17 feet of rope, or enough to go around the door once (vertically) and tie to the handle on the back of the door.

Image via Freepik.com



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- ❑ A cardboard box, book, or piece of wood/plastic.

Instructions:

1. Tie one end of the rope around the knob or handle on the backside of the door.
2. Wrap the rope around the door from top to bottom, moving it more toward the center of the door.
3. Pull it taught, under the door, and tie it around the knob or handle on the backside of the door again.
4. Between the rope and the door, place a cardboard box, book, piece of wood, plastic box, or anything light enough to stay in place and sturdy enough to make the rope taut and approximately 8 inches to 10 inches away from the door.
5. Pluck the rope to hear the sound.

Door Fiddle

Backside side of door with rope on handle

Images via WestEd [CC-BY-NC-SA 4.0]

Instruments for Investigation Stations

5. Tuning Fork

Materials:

- ❑ Purchase tuning forks. Note: lower hertz tuning forks like 440 Hz or 512 Hz will produce better results in vibrating salt or sprinkles.

Image by auntmasako via Pixabay.com [Public Domain]

Instructions:

1. Gently tap the tuning fork on the edge of the desk to hear the sound.

Instruments for Investigation Stations

6. Fishing Line Instrument

Materials:

- ❑ 1 craft stick
- ❑ 1 plastic cup
- ❑ 1 plastic bottle
- ❑ Cap for plastic bottle
- ❑ 12 inches of fishing line
- ❑ Glue gun

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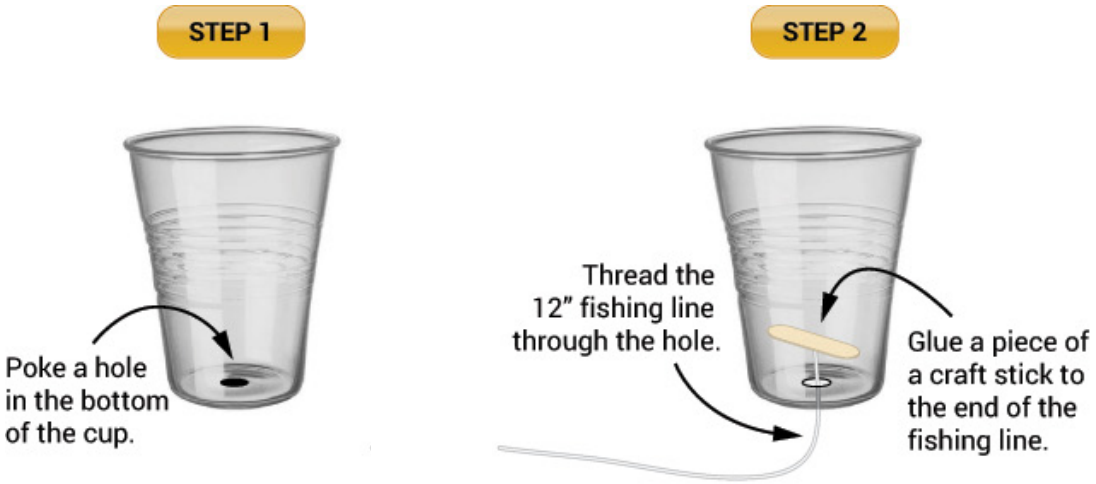
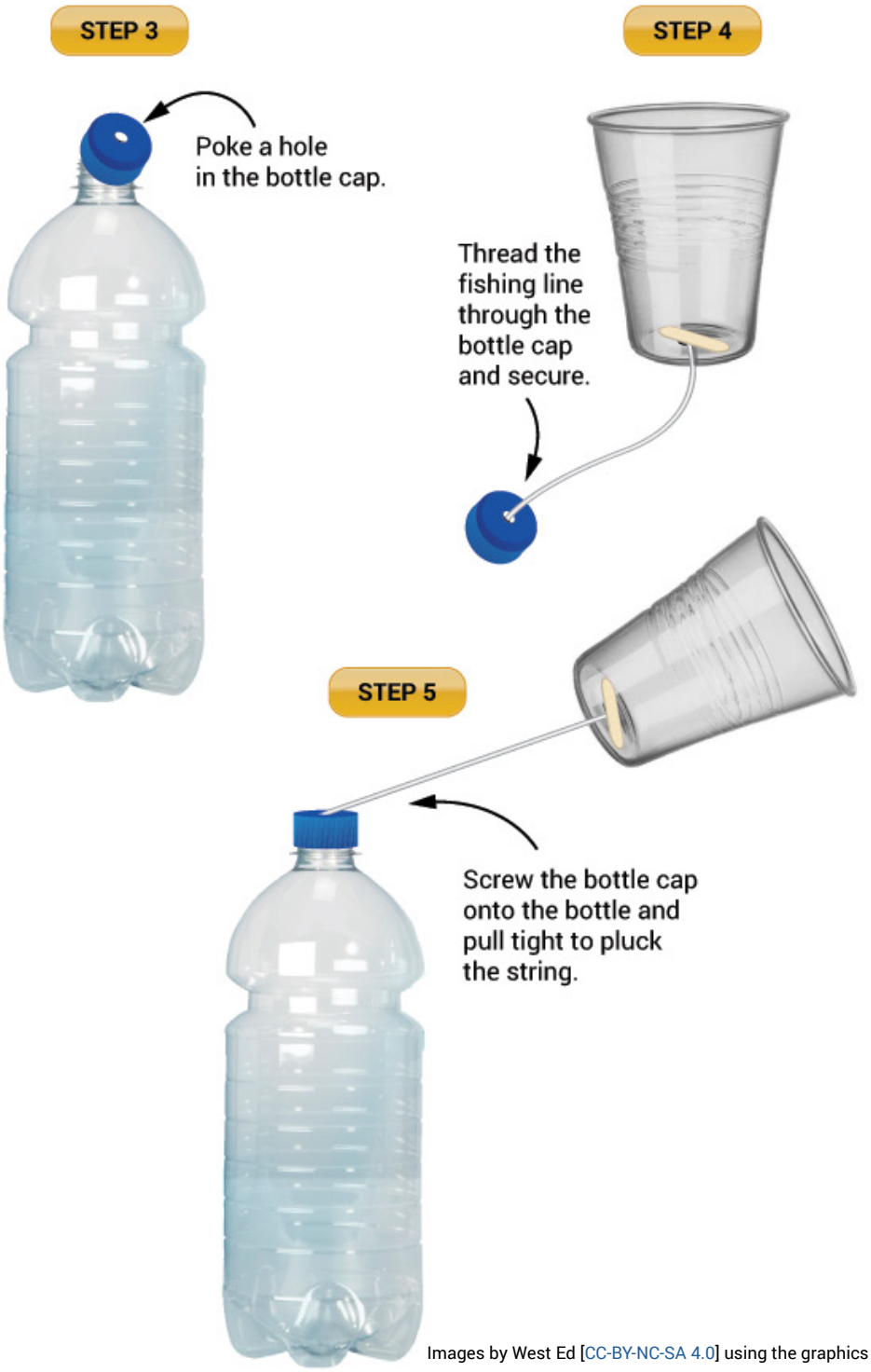
Instructions:



Images by West Ed [CC-BY-NC-SA 4.0] using the graphics listed above.

Instruments for Investigation Stations

6. Fishing Line Instrument (continued)



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Performance Assessment Checklist

Student Name	Science and Engineering Practices			Disciplinary Core Ideas			Crosscutting Concepts	Notes
	Asking Questions and Defining Problems	Planning and Carrying Out Investigations	Constructing Explanations and Designing Solutions	PS4.A: Wave Properties	PS4.C: Information Technologies and Instrumentation	ETS1.A: Defining and Delimiting Engineering Problems	Cause and Effect	

Appendix 1.1

Sound Vibrations

Next Generation Science Standards (NGSS)

This lesson is building toward:

PERFORMANCE EXPECTATIONS (PE)	
1-PS4-1	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

NGSS Lead States. 2013. Next Generation Science Standards: For States, By States. Washington, DC: The National Academies Press.

SCIENCE AND ENGINEERING PRACTICES (SEP)

Asking Questions and Defining Problems

Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Ask and/or identify questions that can be answered by an investigation.

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.
- Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.

DISCIPLINARY CORE IDEAS (DCI)

PS4.A: Wave Properties

- Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1).

Appendix 1.1

CROSSCUTTING CONCEPTS (CCC)
Cause and Effect
• Simple tests can be designed to gather evidence to support or refute student ideas about causes. • Events have causes that generate observable patterns.

Common Core State Standards (CCSS)

CCSS ELA WRITING
CCSS.ELA-LITERACY.W.1.2 Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.
CCSS ELA SPEAKING & LISTENING
CCSS.ELA-LITERACY. SL.1.1 Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
CCSS.ELA-LITERACY. SL.1.6 Produce complete sentences when appropriate to task and situation.

California English Language Development (ELD) Standards

CA ELD		
Part 1.1.1: Exchanging information and ideas with others through oral collaborative conversations on a range of social and academic topics		
EMERGING	**EXPANDING**	**BRIDGING**
P1.1.1 Contribute to conversations and express ideas by asking and answering *yes-no* and *wh-* questions and responding using gestures, words, and simple phrases.	**P1.1.1** Contribute to class, group, and partner discussions by listening attentively, following turn-taking rules, and asking and answering questions.	**P1.1.1** Contribute to class, group, and partner discussions by listening attentively, following turn-taking rules, and asking and answering questions.
In addition to the standard above, you may find that you touch on the following standards in this lesson as well: **P1.1.3:** Offering and supporting opinions and negotiating with others in communicative exchanges **P1.1.5:** Listening actively to spoken English in a range of social and academic contexts **P1.1.10:** Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology **P1.1.11:** Supporting own opinions and evaluating others' opinions in speaking and writing		