

# 1 Sounds



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*Anchoring Phenomenon: Emergency sirens make loud sounds.*

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# Grade 1 Sounds: Introduction

The California K-8 NGSS Early Implementation Initiative, developed by the K-12 Alliance at WestEd with close collaborative input on its design and objectives from the State Board of Education, the California Department of Education, and Achieve is a fast-start demonstration project to build local education agency (LEA) capacity to fully implement the Next Generation Science Standards (NGSS) as a core subject in the elementary grades (K–5) and as the SBE’s preferred integrated model in grades 6–8.

The four-year Initiative provides teachers and administrators with in-depth, content-rich professional development to build leadership capacity and teacher acumen to deliver high-quality 3-dimensional learning for K–8 students. In addition, through collaborations among the K-12 Alliance, Achieve, and others, the LEAs in the Collaborative have opportunities to pilot test new NGSS-aligned tools, processes, assessment item prototypes, and digital and other instructional materials. The LEAs serve as resources for NGSS implementation across California, and in other NGSS-adopting states as well.

This resource presents the conceptual storyline for a unit of instruction at a specific grade level, then focuses on a portion of the storyline called a learning sequence. The learning sequence uses the three dimensions of the NGSS (disciplinary core ideas—DCI; science and engineering practices—SEP; and crosscutting concepts—CCC) to build and deepen student understanding of natural phenomena and design challenges.

Participants in the CA NGSS K-8 Early Implementation Initiative developed and field-tested the lessons in the learning sequence. The sequences were vetted by the Science Peer Review Panel using Achieve’s EQuIP rubric and found to be aligned with the intent of the NGSS.

## Overview

After completing this unit, students will never look at an ambulance or police car the same way again. The anchoring phenomenon for this unit is “Emergency sirens make loud sounds.” This unit would be part of a Physical Science unit on Sound and Light. In this unit, students identify that sounds cause vibrations and vibrations cause sound, and that sound is used to communicate over distance. While walking the playground, students observe the sounds that they hear around them. They then conduct investigations into how sound is made and explore the cause and effect relationship between sounds and vibrations. Students will also design devices that use sound to communicate over a distance.

**EXAMPLE:** Students observe a tabletop siren. They identify the use of sound to communicate and describe how sound and vibrations are related to one another.

The Performance Expectations (PEs) addressed in this unit are:

- 1-PS4-1** Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.
- K-2-ETS1-1** 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.

## Learning Sequence Narrative

The Learning Sequence Narrative briefly describes what students do in each lesson and links the learning between the lessons as a conceptual storyline. At the end of each learning sequence, students make connections to their understanding of the investigative phenomenon (and to the anchoring phenomenon if appropriate).

The anchoring phenomenon for the learning sequence is, “Emergency sirens make loud sounds.” The investigative phenomena for the learning sequence are as follows:

- Instruments have parts that vibrate, causing sound. (Lesson 1)
- Devices communicate over a distance using sound. (Lesson 2)
- Sound causes matter to vibrate. (Lesson 3)

Students figure out this phenomenon by:

### Science and Engineering Practices (SEPs)

#### Asking Questions and Defining Problems

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

- 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.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

#### 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.

- With guidance, plan and conduct an investigation in collaboration with peers.
- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.
- Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.
- Make observations (firsthand or from media) to collect data that can be used to make comparisons.
- Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.
- Make predictions based on prior experiences.

### **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 phenomenon and designing solutions.

- Make observations (firsthand and from media) to construct an evidence-based account for natural phenomena.
- Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
- Generate and/or compare multiple solutions to a problem.

### **Disciplinary Core Ideas (DCIs)**

#### **PS4.A: Wave Properties**

- Sounds can make matter vibrate and vibrating matter can make sounds.

#### **PS4.C: Information Technologies and Instrumentation**

- People use a variety of devices to communicate (send and receive information) over long distances.

#### **ETS1.A: Defining and Delimiting Engineering Problems**

- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problem.

## Crosscutting Concepts (CCCs)

### Cause and Effect

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

The following Learning Sequence Narrative is based on the conceptual flow found at the end of this section.

## Lesson 1: Sound Vibrations

This is the first lesson out of a sequence of three. The lesson begins by connecting to the fact that kids hear sounds all day, every day by going on a sense walk and generating a list of things observed, specifically focusing on sounds heard. The anchoring phenomenon, “Emergency sirens make loud sounds,” is introduced in this lesson as one of the sounds that we hear or have heard before. The challenge of engineering a pretend siren for an ambulance that has a broken siren is introduced as the unifying event.

Students are encouraged to ask questions and to determine which ones can be investigated. Students will need support with the practice of asking questions, especially ones that can be investigated, as they usually do not have experience with this concept. Teachers can provide modified levels of support to students depending on their experience and language needs. The focus is on “What causes sound?”

As the lesson progresses, students are challenged to use materials at given stations to make sound and figure out what the cause of that sound is. During this time, you will model how to plan and carry out an investigation. The large take-away at the end of the lesson is that vibrating matter makes sound. This idea is built up during the next lesson, where students are challenged to construct devices that make loud sounds as a form of communication.

## Lesson 2: Communicate with Sounds

In the previous lesson, students identified that they hear many different sounds. Then they planned and carried out an investigation to try to figure out what causes sound. They used a variety of instruments to find that vibrating material causes sound. This lesson further develops this concept by having students apply their incipient knowledge about what causes sound to solve a challenge and create a device to communicate over a distance. The next lesson will have students investigate how sound causes vibrations.

## Lesson 3: See Sounds

This is the third lesson in the learning sequence. In the two previous lessons, students explored the idea that vibrations cause sound. They have also used sound to communicate over a distance. In this lesson, the students explore the phenomenon that sound causes matter to vibrate, which completes the cause and effect relationship between sound and vibrations. They investigate vibrations using a drum and a tuning fork and draw a group model that explains the cause and effect relationship between sound and vibration.

## Learning Sequence 3-Dimensional Progressions

### SEP PROGRESSION

#### Asking Questions and Defining Problems

<b>Prior Experience</b>	Examples of prior experience from Kindergarten might include challenges of rolling balls onto different surfaces.
<b>Lesson 1</b>	In this lesson, students ask questions based on their observations of the natural world (the school playground), specifically focusing on the sounds they hear. They then ask and/or identify questions, with the help of the teacher, which can be answered by an investigation. The focus of this lesson is for students to gather evidence to answer the question “What causes sound?”
<b>Lesson 2</b>	In this lesson, students define a simple problem (“What would happen if the siren of an ambulance was not working?”) that can be solved, within the constraints of available materials, through the development of a new or improved object or tool.
<b>Lesson 3</b>	In this lesson, students ask questions about why sound causes matter to vibrate. They ask and/or identify questions, with the help of the teacher, which can be answered by an investigation. The focus of this lesson is for students to gather evidence to answer the question “What makes sound?”

#### Planning and Carrying Out Investigations

<b>Prior Experience</b>	Students are expected to come in with experience in conducting investigations, with guidance, on the effects of pushes and pulls from Kindergarten. This learning sequence will provide students with the opportunity to plan their investigations with less guidance.
<b>Lesson 1</b>	In this lesson, students are introduced to the basic steps in planning and conducting an investigation. They create a chart that includes identifying the question (what causes sound?), the materials to be used (different instruments), and the data collection. With guidance, they collaboratively plan and conduct an investigation to produce observations (data) to serve as the basis for providing evidence to answer a question about vibrating matter causing sound.
<b>Lesson 2</b>	In this lesson, students are challenged to plan, build, and test a device that can be used to communicate over a distance. Building on the previous lesson where they planned and conducted an investigation to collect data on what causes sound, students now have to plan and carry out an investigation to test solutions to a problem (a non-working siren on an ambulance).
<b>Lesson 3</b>	In this lesson, students use their experience from previous lessons to plan and conduct an investigation to provide evidence that sound causes matter to vibrate. They use the What I Wonder T-chart from Lesson 1: Sound Vibrations and identify the question, the materials, and how to collect data.

## Learning Sequence 3-Dimensional Progressions (continued)

### Constructing Explanations and Designing Solutions

<b>Prior Experience</b>	Students will have little experience with constructing explanations in Kindergarten. They do come in with some experience designing solutions when they build structures to reduce the warming effect of sunlight on an area, which this lesson sequence will build on by having students design solutions to a problem with a non-functioning siren.
<b>Lesson 1</b>	In this lesson, students make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons. They also use information from their observations (firsthand or from media) to construct an evidence-based account for natural phenomena (vibrating matter causes sound) using 1-PS4-1.
<b>Lesson 2</b>	In this lesson, students design a solution to a problem (non-working siren in the ambulance) by building and testing their own device that causes a loud sound to communicate over a distance. They compare their device to that of the other groups and reinforce the notion that vibrating matter causes sound and this pattern is repeated in every device.
<b>Lesson 3</b>	In this lesson, students build explanations about sound causing matter to vibrate. They draw a group model of a drum and a tuning fork making sprinkles vibrate and are asked to label what is vibrating and what is causing the vibrations to happen.

### DCI PROGRESSION

<b>Prior Experience</b>	Students will have no experience with PS4.A (Wave Properties) and PS4.C (Information Technologies and Instrumentation) since those ideas are introduced in Grade 1. They should have had experience with ETS1.A, (Defining and Delimiting Engineering Problems), as they worked to change the speed and direction of an object with a pull or a push in Kindergarten.
<b>Lesson 1</b>	Wave Properties: Sound can make matter vibrate, and vibrating matter can make sound. (PS4.A) Students are introduced to the properties of waves with a focus on how vibrating matter can make sound. They use this understanding and their observations to explain why the instruments make noise.
<b>Lesson 2</b>	Information Technologies and Instrumentation: People use a variety of devices to communicate (send and receive information) over long distances (PS4.C). Students use their experience with vibrating matter (PS4.A) from the previous lesson to answer a challenge: to build a device that can communicate over a distance (ETS1.A).
<b>Lesson 3</b>	Wave Properties: Sound can make matter vibrate, and vibrating matter can make sound. (PS4.A) Students focus on how sound can make matter vibrate.

## Learning Sequence 3-Dimensional Progressions (continued)

### CCC PROGRESSION

#### Cause and Effect

<b>Prior Experience</b>	Students come in with much experience with cause and effect from Kindergarten. They have used this crosscutting concept to better understand the effect of pushes and pulls on moving objects and the effect of sunlight on Earth's surface. This lesson sequence will give students more practice with cause and effect as they use this crosscutting concept to understand how vibration causes sound. They will also be expected to have experience with patterns as they studied weather patterns over time in Kindergarten.
<b>Lesson 1</b>	In this lesson, students identify causal relationships by observing and describing what causes the sounds heard during a sound walk and during an investigation using musical instruments. They collaboratively use their observations to answer the question, "What is the cause of this event?" and learn that events have causes that generate observable patterns.
<b>Lesson 2</b>	In this lesson students design a test to gather evidence (or refute ideas) about a possible cause and identify cause and effect relationships to explain that vibrating matter causes sound that can be used to communicate over a distance. By comparing their devices, they explicitly identify a pattern.
<b>Lesson 3</b>	In all three lessons, students use this crosscutting concept to build an explanation that vibrating matter causes sound and that sound causes matter to vibrate. In this lesson, they explicitly collect data to describe what causes the movement to occur and draw a model that explains what is vibrating and what causes this vibration. They identify observable patterns in the effects of sound on the drum and tuning fork.

## Science and Engineering Practices for K–2

<p><b>Asking Questions and Defining Problems</b></p>	<p>Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.</p> <ul style="list-style-type: none"> <li>• Ask questions based on observations to find more information about the natural and/or designed world(s).</li> <li>• Ask and/or identify questions that can be answered by an investigation.</li> <li>• Define a simple problem that can be solved through the development of a new or improved object or tool.</li> </ul>
<p><b>Developing and Using Models</b></p>	<p>Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</p> <ul style="list-style-type: none"> <li>• Distinguish between a model and the actual object, process, and/or events the model represents.</li> <li>• Compare models to identify common features and differences.</li> <li>• Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).</li> <li>• Develop a simple model based on evidence to represent a proposed object or tool.</li> </ul>
<p><b>Planning and Carrying Out Investigations</b></p>	<p>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.</p> <ul style="list-style-type: none"> <li>• With guidance, plan and conduct an investigation in collaboration with peers (for K).</li> <li>• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.</li> <li>• Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.</li> <li>• Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.</li> <li>• Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.</li> <li>• Make predictions based on prior experiences.</li> </ul>
<p><b>Analyzing and Interpreting Data</b></p>	<p>Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.</p> <ul style="list-style-type: none"> <li>• Record information (observations, thoughts, and ideas).</li> <li>• Use and share pictures, drawings, and/or writings of observations.</li> <li>• Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.</li> <li>• Compare predictions (based on prior experiences) to what occurred (observable events).</li> <li>• Analyze data from tests of an object or tool to determine if it works as intended.</li> </ul>

Science and Engineering Practices for K–2 (continued)

<p><b>Using Mathematical and Computational Thinking</b></p>	<p>Mathematical and computational thinking in K–2 builds on prior experience and progresses to recognizing that mathematics can be used to describe the natural and designed world(s).</p> <ul style="list-style-type: none"> <li>• Decide when to use qualitative vs. quantitative data.</li> <li>• Use counting and numbers to identify and describe patterns in the natural and designed world(s).</li> <li>• Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.</li> <li>• Use quantitative data to compare two alternative solutions to a problem.</li> </ul>
<p><b>Constructing Explanations and Designing Solutions</b></p>	<p>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.</p> <ul style="list-style-type: none"> <li>• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> <li>• Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.</li> <li>• Generate and/or compare multiple solutions to a problem.</li> </ul>
<p><b>Engaging in Argument from Evidence</b></p>	<p>Engaging in argument from evidence in K–2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s).</p> <ul style="list-style-type: none"> <li>• Identify arguments that are supported by evidence.</li> <li>• Distinguish between explanations that account for all gathered evidence and those that do not.</li> <li>• Analyze why some evidence is relevant to a scientific question and some is not.</li> <li>• Distinguish between opinions and evidence in one’s own explanations.</li> <li>• Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument.</li> <li>• Construct an argument with evidence to support a claim.</li> <li>• Make a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.</li> </ul>
<p><b>Obtaining, Evaluating, and Communicating Information</b></p>	<p>Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.</p> <ul style="list-style-type: none"> <li>• Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).</li> <li>• Describe how specific images (e.g., a diagram showing how a machine works) support a scientific or engineering idea.</li> <li>• Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question and/or supporting a scientific claim.</li> <li>• Communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.</li> </ul>

## Grade 1 Sounds Instructional Rubric

	Level 1 Emerging	Level 2 Developing	Level 3 Proficient	Level 4 Advanced
<p><b>Science and Engineering Practice</b></p> <p>Asking Questions and Defining Problems</p>	<ul style="list-style-type: none"> <li>Students do not ask questions or ask general questions about the phenomenon.</li> <li>Students are unable to define a problem (design) or it is impractical.</li> </ul>	<ul style="list-style-type: none"> <li>Students ask specific testable questions about the phenomenon that are based on direct observation.</li> <li>Students define a problem (design) that is minimally aligned to the phenomenon.</li> </ul>	<ul style="list-style-type: none"> <li>Students ask specific questions about the phenomenon that can be answered through an investigation and require sufficient and appropriate empirical evidence to answer.</li> <li>Students define a problem (design) statement that is adequately aligned to the intent of the problem.</li> </ul>	<ul style="list-style-type: none"> <li>Students ask specific questions that require sufficient and appropriate empirical evidence to answer and students explain why it is a testable question.</li> <li>Students define a problem (design) statement that is completely aligned to the intent of the problem.</li> </ul>
<p><b>Science and Engineering Practice</b></p> <p>Planning and Carrying Out Investigations</p>	<ul style="list-style-type: none"> <li>Students do not plan or conduct an investigation or propose an investigation that will not produce relevant data to be used as evidence to answer the empirical question.</li> <li>Students do not design a solution that solves a problem or meets a goal.</li> </ul>	<ul style="list-style-type: none"> <li>Students plan investigations that will produce minimal relevant data to be used as evidence to answer the empirical question.</li> <li>Students design a solution that minimally solves a problem or meets a goal.</li> </ul>	<ul style="list-style-type: none"> <li>Students plan or conduct investigations collaboratively to gather some relevant data to be used as evidence to answer the empirical question.</li> <li>Students design a solution that adequately solves a problem or meets a goal.</li> </ul>	<ul style="list-style-type: none"> <li>Students plan and conduct an investigation collaboratively that will produce relevant data to be used as evidence to answer the empirical question.</li> <li>Students design a solution and propose an explanation that solves a problem or meets a goal.</li> </ul>
<p><b>Science and Engineering Practice</b></p> <p>Constructing Explanations and Designing Solutions</p>	<ul style="list-style-type: none"> <li>Students do not construct scientific explanations or use inaccurate or inappropriate scientific ideas.</li> <li>Students do not use data to evaluate how well the design addresses the problem and the redesign of the original model is incomplete.</li> </ul>	<ul style="list-style-type: none"> <li>Students use accurate but minimal scientific ideas to construct scientific explanations, and students' explanations are descriptive instead of explaining how or why a phenomenon occurs.</li> <li>Students use minimal data to evaluate how well the design addresses the problem and outline an appropriate redesign of the original model.</li> </ul>	<ul style="list-style-type: none"> <li>Students use accurate and adequate scientific ideas to construct scientific explanations, but students' explanations are descriptive instead of explaining how or why a phenomenon occurs.</li> <li>Students use adequate data to evaluate how well the design addresses the problem and explain an appropriate redesign of the original model.</li> </ul>	<ul style="list-style-type: none"> <li>Students use accurate and complete scientific ideas, principles, and/or evidence (experimental data) to construct an evidence-based explanation of the phenomenon.</li> <li>Students use complete data to evaluate how well the design addresses the problem and provides a detailed rationale for the appropriate redesign of the original model.</li> </ul>

# Grade 1 Sounds: Introduction

## Grade 1 Sounds Instructional Rubric (continued)

	Level 1 Emerging	Level 2 Developing	Level 3 Proficient	Level 4 Advanced
<p><b>Disciplinary Core Ideas</b></p> <p>PS4.A: Sound can make matter vibrate, and vibrating matter can make sound.</p> <p>PS4.C: People use a variety of devices to communicate over long distances.</p>	<ul style="list-style-type: none"> <li>Students identify or apply irrelevant content or relevant content with major errors.</li> <li>Students cannot explain that vibrations produce sound or sound produces vibrations.</li> </ul>	<ul style="list-style-type: none"> <li>Students identify or apply relevant content with minor errors.</li> <li>Students can explain that vibrations produce sound or sound produces vibrations with minor errors.</li> </ul>	<ul style="list-style-type: none"> <li>Students explain and apply relevant and accurate content.</li> <li>Students can explain that vibrations produce sound or sound produces vibrations.</li> </ul>	<ul style="list-style-type: none"> <li>Students explain and apply relevant and accurate content.</li> <li>Students can explain that vibrations produce sound and sound produces vibrations.</li> </ul>
<p><b>Disciplinary Core Ideas (Engineering)</b></p> <p>ETS1.A: A situation that people want to change or create can be approached as a problem to be solved through engineering.</p>	<ul style="list-style-type: none"> <li>Students identify the human problem and solution that do not match the situation and describe features of their tool that are unrelated to the solution.</li> </ul>	<ul style="list-style-type: none"> <li>Students generally identify a relevant solution to the problem and describe features of their tool that are unrelated to the solution.</li> </ul>	<ul style="list-style-type: none"> <li>Students accurately identify a relevant solution to the problem and generally describe how the features of their tool are related to the solution.</li> </ul>	<ul style="list-style-type: none"> <li>Students accurately identify the situation that people want to change and the desired outcome, and clearly describe the features of the tool that would solve the problem based on scientific information and materials available.</li> </ul>
<p><b>Crosscutting Concepts</b></p> <p>Cause and Effect: Events have causes that generate observable patterns; simple tests can be designed to gather evidence to support or refute student ideas about causes.</p>	<ul style="list-style-type: none"> <li>Students do not identify or make connections to the crosscutting concept.</li> <li>Students cannot explain a cause and effect relationship or use the relationship to explain that vibrations produce sound and sound produces vibrations.</li> </ul>	<ul style="list-style-type: none"> <li>Students identify or make a connection to the crosscutting concept (with minor errors).</li> <li>Students can explain a cause and effect relationship or use the relationship to explain that vibrations produce sound and sound produces vibrations, with minor errors.</li> </ul>	<ul style="list-style-type: none"> <li>Students explain or make an accurate connection to the crosscutting concept.</li> <li>Students can explain a cause and effect relationship or can use the relationship to explain that vibrations produce sound and sound produces vibrations.</li> </ul>	<ul style="list-style-type: none"> <li>Students explain and make accurate connections to the crosscutting concept.</li> <li>Students can explain a cause and effect relationship and use the relationship to explain that vibrations produce sound and sound produces vibrations.</li> </ul>

## Student Support Strategies

Differentiated student support strategies offer teachers a way to meet all students' needs. The classroom brings together students from different backgrounds with varying degrees of science knowledge. Being an effective teacher, therefore, requires the implementation of creative and innovative teaching strategies in order to meet students' individual needs.

Throughout these lessons, a flag (▶) denotes formative assessment opportunities where you may change instruction in response to students' level of understanding and making sense of phenomena. Below are some strategies you might implement based on those assessments. There is no one strategy that works best for every teacher, so try different strategies to determine which are best for you and your students.

Suggested strategies for students who *have not* met the targeted expectations:

- **Centers:** Set up a center at which students can continue to explore making vibrations and hearing/feeling sound. Pair students so that a student who understands the concept well works with another student who needs help. This also helps those students who have a deeper understanding of the concepts as they refine their thinking through teaching.
- **Small Group Reteach:** Set up a modified investigation in which students can work with the concept of vibrations producing sound. Select a few students who need extra support and question them as they explore the instruments.
- **One-on-One Conferences:** Use silent reading time or other times when students work independently to conference with small groups or individual students.
- **Sticky-note Feedback:** Write comments and questions on sticky-notes about the student's written work in their notebooks. This will help students reflect on their thinking and improve their performance.
- **Group Consensus:** After completing their work, have students work with a partner or a small group to compare answers or notebook entries. They should have a discussion resulting in a response everyone agrees with. Then have them share that response with the class or use the Use of Color or Line of Learning strategy to change the response in their notebook.
- **Key Points:** Have students describe the important points that should have been included in their model. List each of those key points on the board. After the discussion, number all of the important ideas. Have students return to their original work and number each of the key points that they included in their own model.

## Grade 1 Sounds: Introduction

- **Use of Color:** Have students use color to correct their original work. For instance, they can use green to indicate key points that they already had in their work, use red to delete information, and use blue to add points from the discussion that they feel support their work.
- **Line of Learning:** Similar to Use of Color, after writing in their notebooks, ask students to put a line under their initial ideas. After the class discussion or a group consensus, students can add new ideas presented below the line. This allows students to add to their own initial written ideas with additional thoughts from other students or the teacher, while identifying the origin of the idea.
- **Sentence Starters:** If students are struggling, provide them with sentence starters. It narrows the focus for their ideas.
- **Find a Good Idea:** If students are stuck and productive struggle has failed, have them go and find a good idea. Let them walk around the class to find a good idea in written work or in completing an experiment. Direct them to bring the good idea back and write it in their notebook, citing where they found the good idea, or who it came from. Then direct them to implement the idea.
- **Scaffolds for Cause and Effect:**
  - When I <cause>, I notice <effect>.
  - If I want <effect>, I need to <cause>.
  - I wonder what the effect would be if \_\_\_\_.
  - I think \_\_\_\_ is causing \_\_\_\_.

Suggested strategies for students who *have* met the targeted expectations:

- **Self-Direction Opportunities:** Present the activities in a more open-ended fashion so students can deepen their understanding of the relationship between vibrations and sound. This can include exploring changes in volume (soft-loud) or pitch (high-low). They can solve problems in novel ways, formulate their own questions, and plan investigations within the constraints of the classroom and available materials.
- **Grouping:** Advanced students are better served when paired up or in small groups; occasionally group them in same-level groups.

## Grade 1 Sounds: Introduction

- **Class Discussion:** Have a student who has met your target expectations lead a debate in class about an experiment or question. The student can present his/her idea, and other students can agree or disagree but must give evidence to back up their thinking. To keep the discussion focused, you can ask questions to keep students' thinking on track.
- **Crosscutting Concepts:** While all students can and should interact with the crosscutting concepts, in this case cause and effect, have advanced students use other crosscutting concepts to think about and make sense of the phenomenon of sound. This could include identifying what patterns they see or how the structure of an instrument produces different sounds (structure and function).
- **Four Corners:** Have students individually determine their ideas about a statement, an answer to a problem, or their thinking about an issue. Label each of the four corners of the classroom with a different response. It could be four different responses to a question or how confident they are in their answer (strongly agree, agree, disagree, strongly disagree). Students move to the corner that best aligns with their thinking. When all students have chosen a corner, have their group discuss why they have chosen that corner. If you have a large group in a corner, divide them into sub-groups so everyone can discuss. Tell them anyone in the group may be called on to defend their group's position.

## Science Talks

Science Talks will be used throughout these lessons. Below is background information and strategies to use with students.

### Scaffolding the Science Talk

Small group discussion (pairs, groups) should always *precede* large group discussion to activate thinking and maximize the likelihood of thoughtful responses in the large group. Small group discussion can serve as a scaffold for English Learners or others less inclined to speak in a large group.

### Revisit Classroom Norms

Many teachers *explicitly teach* (through mini lessons) and practice conversation norms prior to launching their first Science Talk. As always, your focus will vary, based on the strengths and challenges of your class.

Possible Norms to Include	Possible Skills to Practice
<ul style="list-style-type: none"><li>• Mutual Respect</li><li>• Attentive Listening</li><li>• Openness to New Ideas</li></ul>	<ul style="list-style-type: none"><li>• Taking turns</li><li>• Listening to others</li><li>• Keeping eyes on the speaker</li><li>• Responding to one another</li><li>• Staying on focus</li><li>• Disagreeing respectfully</li></ul>

### Characteristics of Science Talks

- Students seated or standing in a circle facing each other (with science notebooks open to the data recorded).
- Set of explicit norms posted for all to see.
- A natural flow to the conversation with a good deal of student-to-student interaction.
- Many students participate, but not necessarily all students each time.
- Conversation is focused on a particular idea where connections are being made.

### Making Meaning Science Talk

*Purpose:* To draw conclusions, explain phenomenon, and raise additional questions

- Comes at end of investigation or unit, based on work already done
- Looks for patterns or relationships in data
- Involves a rigorous examination of data (from notebook or class data table) to identify what data might support a claim
- May include contradictory data or new evidence
- Is not a simple sharing-out of group results

## Teacher's Role in Making Meaning Science Talk

<b>Before</b>	<ul style="list-style-type: none"> <li>• Offer a clearly stated question (often the focus question).</li> <li>• Ensure that small groups have shared procedures and data beforehand.</li> </ul>
<b>During</b>	<ul style="list-style-type: none"> <li>• Reinforce classroom norms.</li> <li>• Maintain focus on investigation question.</li> <li>• Push for analysis and debate.</li> <li>• Guide discussion toward conclusion or next steps.</li> <li>• May gently push for evidence or probe for deeper explanation.</li> </ul>
<b>After</b>	<ul style="list-style-type: none"> <li>• Provide a clear synthesis statement of discussion.</li> <li>• Gently correct misunderstandings or allow for further investigation.</li> </ul>

## Student Conversation Moves

Some teachers co-develop and post helpful prompts or sentence frames.

*Examples:*

Scientists CLARIFY	Scientists QUESTION	Scientists AGREE	Scientists RESPECTFULLY DISAGREE
<ul style="list-style-type: none"> <li>• Can you clarify what you mean?</li> <li>• Can you say more about that idea?</li> <li>• Could you show me how you got that information?</li> </ul>	<ul style="list-style-type: none"> <li>• Why do you think that?</li> <li>• I was wondering about ___?</li> </ul>	<ul style="list-style-type: none"> <li>• I agree with ___ because ___.</li> <li>• My data also supports ___ because ___.</li> </ul>	<ul style="list-style-type: none"> <li>• I had a different result I'd like to share.</li> <li>• That's interesting, but my data show ___.</li> <li>• Even though you said ___, I think ___.</li> </ul>

## Teacher Prompts or Probes

<i>For inviting participation</i>	<ul style="list-style-type: none"> <li>• What do you think?</li> <li>• How is what she saw different from what you saw?</li> <li>• What would you like to add to the conversation?</li> <li>• Can you say more about ___?</li> <li>• What are you thinking now?</li> </ul>
<i>For encouraging student-student exchange</i>	<ul style="list-style-type: none"> <li>• Matt, you had a different idea than Maria. Can you share that idea?</li> <li>• Who can build on what ___ just said?</li> <li>• Whose data supports (or disagrees) with what ___ just said?</li> </ul>
<i>For refocusing discussion</i>	<ul style="list-style-type: none"> <li>• Keep that thought, and we'll come back to it if we have time. Right now, we need to be focused on...</li> </ul>
<i>Correcting student misunderstandings*</i>	<ul style="list-style-type: none"> <li>• What evidence do you have to support that claim?</li> <li>• Do we have enough evidence to support that claim? What could be another explanation?</li> <li>• I think we need to go back and try ___ and see if it holds up.</li> </ul>

\**Addressing Student Misunderstandings.* Many teachers hold off on correcting misunderstandings until after the Science Talk, though they will probe students for further evidence in the moment. In this way, teachers and students value the knowledge constructed through the discussion itself, rather than looking for the teacher to provide the correct answer.

## Considerations for Planning a Science Talk

- What scaffolds (i.e., wait time, quick-writes, or think-pair-shares) will you use to support English Learners or reluctant speakers in the large group setting?
- How long can your students maintain their focus in a large group discussion?
- What is the best seating or standing arrangement that encourages focus while minimizing distractions? *For younger grades*, transition students to holding notebooks on their laps.
- What sentence frames will you use? How many will you provide? At what level of complexity? How will you phase out scaffolds to encourage independence?
- How active or passive of a facilitator do you plan to be?
- What might be expected student responses during the Science Talk?
- What questions and alternative scenarios can you think of presenting to students during the talk to challenge their thinking and get to a deeper level of understanding?

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## Grade 1 Sounds Conceptual Flow

**Anchoring Phenomenon**  
Emergency sirens make loud sounds.

**We can hear and feel sound.**

**Investigative Phenomenon**  
Instruments have parts that vibrate, causing sound.

**Investigative Phenomenon**  
Devices communicate over a distance using sound.

**Investigative Phenomenon**  
Sound causes matter to vibrate.

**PS4.A** We hear sounds.

**PS4.C** People use sound to communicate.

**PS4.A** We can feel/see some sounds/vibrations.

Use senses.

Matter can vibrate and produce sounds.

Sounds can be loud or quiet. (volume)

Sound travels.

Sounds can make matter vibrate.

Matter can vibrate and produce sounds.

Asking questions

Planning and carry out investigations

Constructing explanations

Defining problems

Asking questions

Designing solutions

Planning and carrying out investigations

Asking questions

**Cause and Effect**



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## 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.

# 1.1 Sound Vibrations



## 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)

# 1.1 Sound Vibrations



## 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) ([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](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) (<https://www.youtube.com/watch?v=6sFMnSNjVJQ>) if needed]
- Chart paper
- [Guitar video](https://www.youtube.com/watch?v=8YGQmV3NxMI) (<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

# 1.1 Sound Vibrations



## 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). (<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) (<https://www.youtube.com/watch?v=8YGQmV3NxMI>) showing guitar strings vibrating.

# 1.1 Sound Vibrations



## 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.

# 1.1 Sound Vibrations

## 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

Initially, 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 \_\_\_?

# 1.1 Sound Vibrations

## TEACHER NOTE (Continued)

You can also 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.

# 1.1 Sound Vibrations

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.

# 1.1 Sound Vibrations

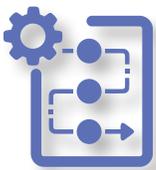
## Explain 1 (10 minutes)

*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.)

# 1.1 Sound Vibrations

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.

# 1.1 Sound Vibrations



## 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.

# 1.1 Sound Vibrations



## 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).

# 1.1 Sound Vibrations

## 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

1.1.R1	<u>Instruments for Investigation Stations</u>	1.1.15
1.1.R2	<u>Performance Assessment Checklist</u>	1.1.22

## 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

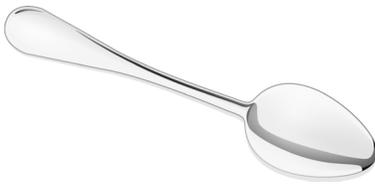


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Image via [Pixabay.com](#) [Public Domain]



Image by [Tango! Desktop Project](#) via Wikimedia Commons [Public Domain]



Image by [Sarah Greenwood](#) via Wikimedia Commons [CC 4.0 International]

#### 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.

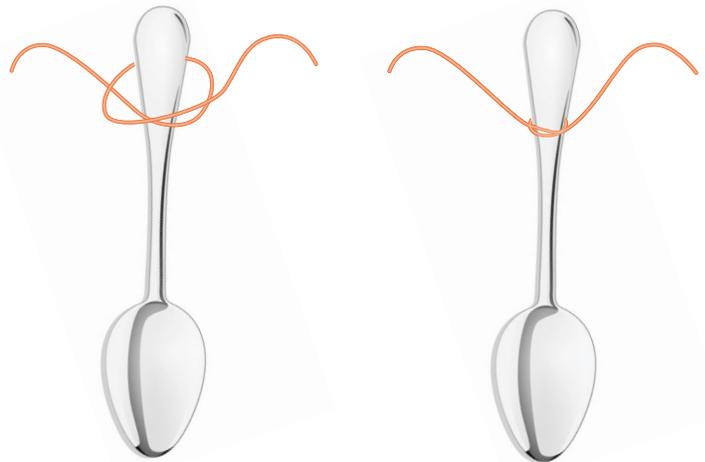


Image by [Conquistador](#) via Wikimedia Commons [CC BY-SA 4.0] and modified by WestEd

## Instruments for Investigation Stations

### 3. Shoe Box Guitar

#### Materials:

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

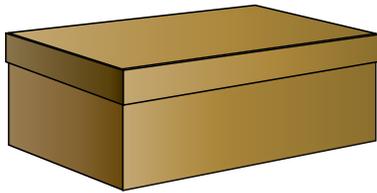


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Image by Tango!  
Desktop Project via  
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Image via Freepik.com

#### 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.

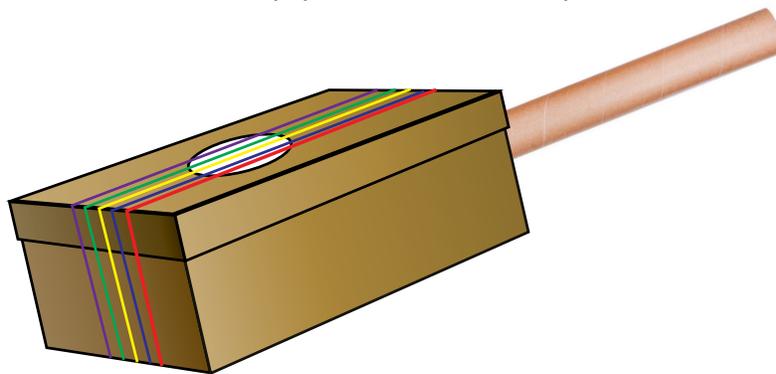


Image via WestEd [CC BY-NC-SA 4.0]

## 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](https://www.freepik.com)



Image via [Pixabay.com](https://www.pixabay.com) [Public Domain]

- ❑ 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 taut, 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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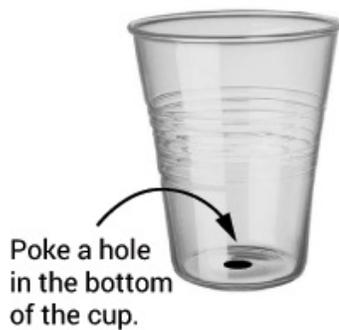
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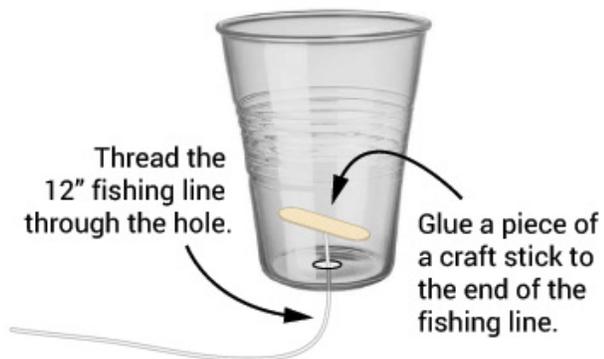
Image by [Catarina mota](#) via Wikimedia Commons [CC BY-SA 3.0]

#### Instructions:

##### STEP 1



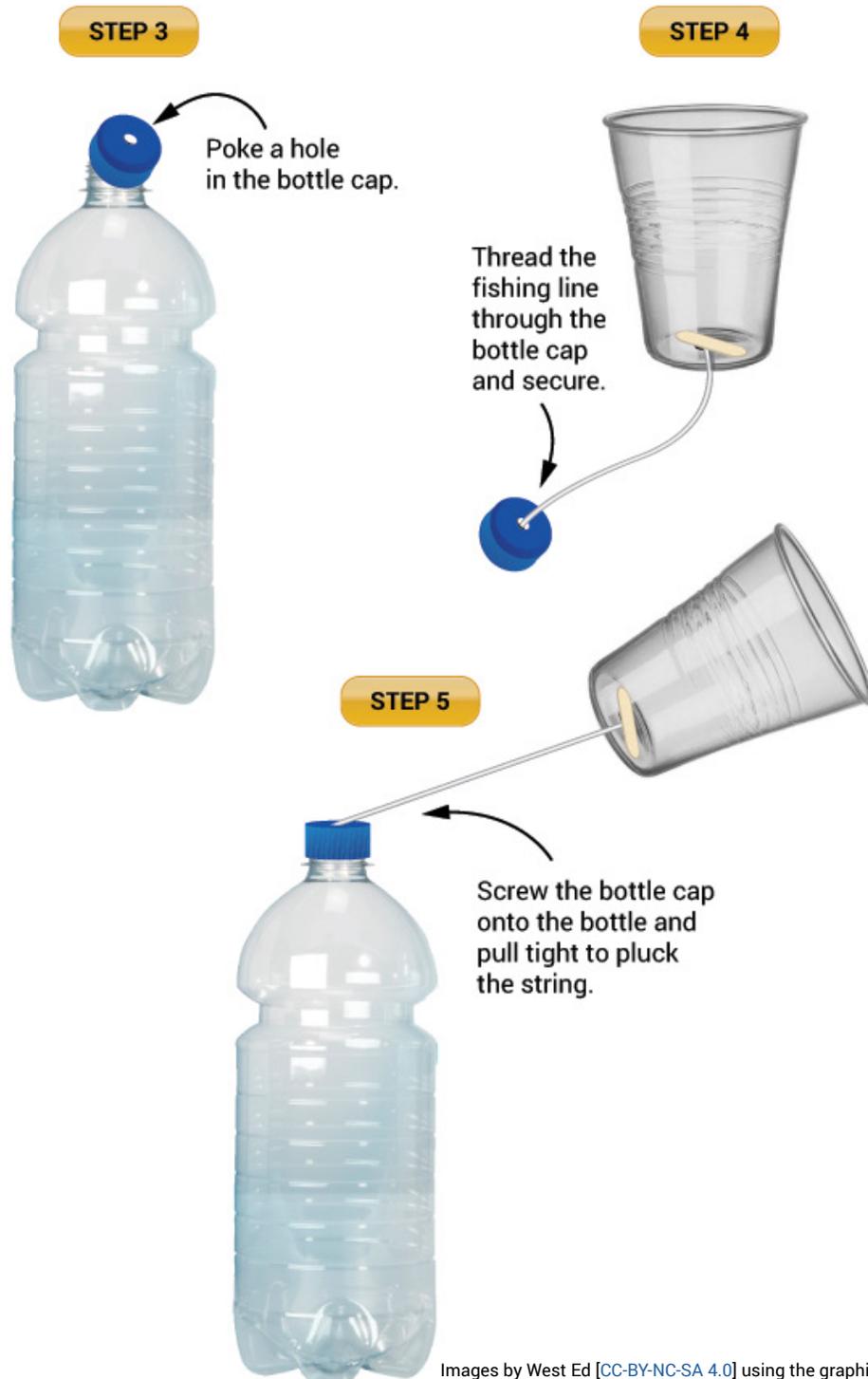
##### STEP 2



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## Instruments for Investigation Stations

### 6. Fishing Line Instrument (continued)



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## Next Generation Science Standards (NGSS)

This lesson is building toward:

PERFORMANCE EXPECTATIONS (PE)	
<b>1-PS4-1</b>	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. <b>[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.]</b>

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

SCIENCE AND ENGINEERING PRACTICES (SEP)
<p><b>Asking Questions and Defining Problems</b></p> <p>Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions.</p> <ul style="list-style-type: none"> <li>• Ask questions based on observations to find more information about the natural and/or designed world(s).</li> <li>• Ask and/or identify questions that can be answered by an investigation.</li> </ul>
<p><b>Planning and Carrying Out Investigations</b></p> <p>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.</p> <ul style="list-style-type: none"> <li>• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.</li> <li>• Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.</li> </ul>
<p><b>Constructing Explanations and Designing Solutions</b></p> <p>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.</p> <ul style="list-style-type: none"> <li>• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> </ul>

DISCIPLINARY CORE IDEAS (DCI)
<p><b>PS4.A: Wave Properties</b></p> <ul style="list-style-type: none"> <li>• Sound can make matter vibrate, and vibrating matter can make sound. (1-PS4-1).</li> </ul>

## 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.

"Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts" are reproduced verbatim from A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. DOI: <https://doi.org/10.17226/13165>. National Research Council; Division of Behavioral and Social Sciences and Education; Board on Science Education; Committee on a Conceptual Framework for New K-12 Science Education Standards. National Academies Press, Washington, DC. This material may be reproduced for noncommercial purposes and used by other parties with this attribution. If the original material is altered in any way, the attribution must state that the material is adapted from the original. All other rights reserved.

## 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.

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## 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

**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.

#### EXPANDING

**P1.1.1** Contribute to class, group, and partner discussions by listening attentively, following turn-taking rules, and asking and answering questions.

#### BRIDGING

**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

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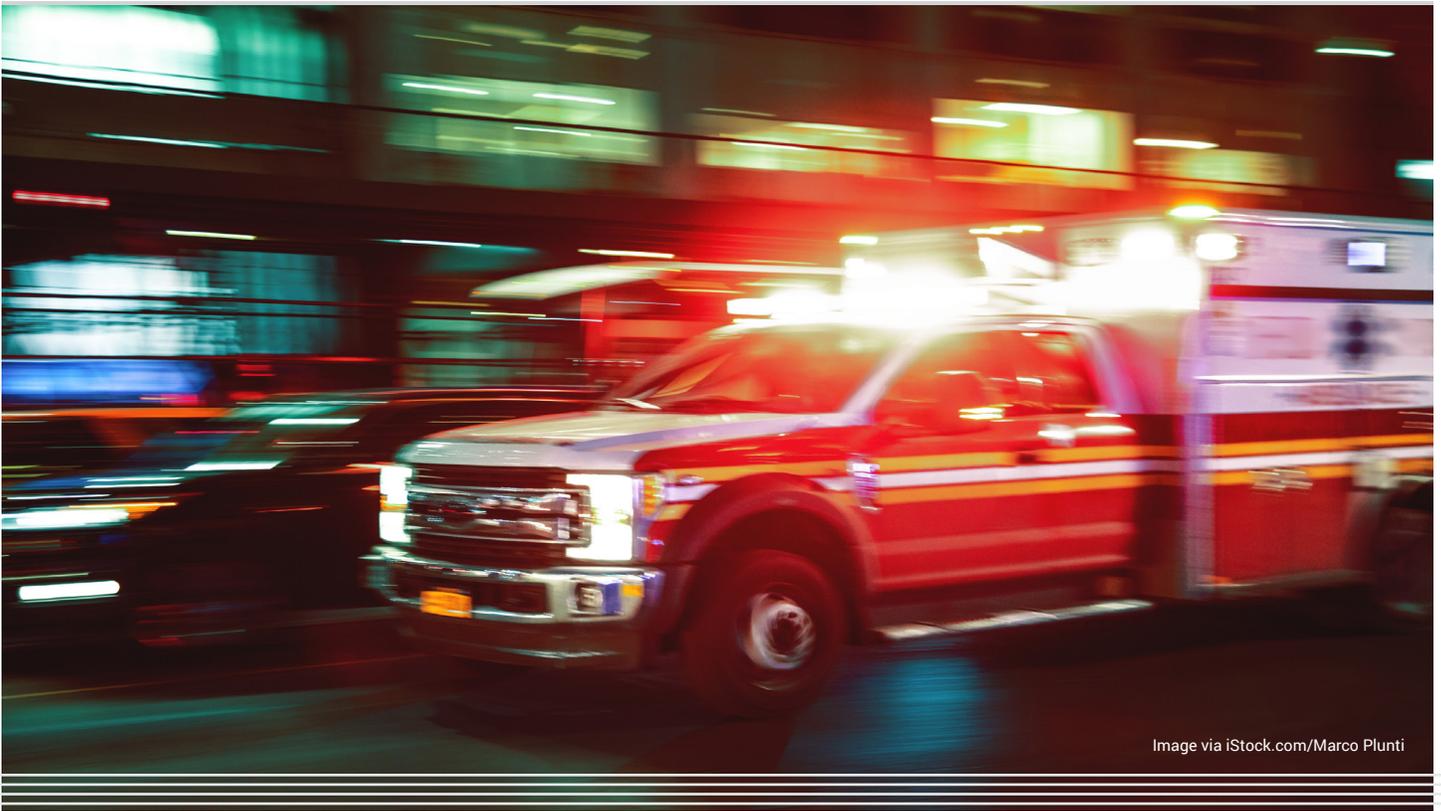


Image via iStock.com/Marco Plunti



## Anchoring Phenomenon

Emergency sirens make loud sounds.



## Lesson Concept

Students will define a simple problem (non-working siren) and design a communication device that solves this problem through engineering.



## Investigative Phenomenon

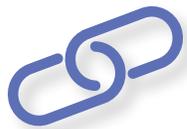
Devices communicate over a distance using sound.



## Standards

Refer to Appendix 1.2 for NGSS, CCSS (ELA), and California ELD Standards.

## 1.2 Communicate with Sounds



### Storyline Link

In the previous lesson, students identified that they hear many different sounds. Then they planned and carried out an investigation to try to figure out what causes sound. They used a variety of different instruments to find that vibrating material causes sound, and they observed patterns. This lesson further develops this concept by having students apply what causes sound to designing, building, and testing a device to communicate over a distance. The following lesson will have students investigating how sound causes vibrations.

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

195 minutes

Part I	40 minutes	(Engage)
Part II	40 minutes	(Explore Part A)
Part III	45 minutes	(Explore Part B)
Part IV	45 minutes	(Explain)
Part V	25 minutes	(Evaluate)

## 1.2 Communicate with Sounds



### Materials

#### Whole Class

- Whistle for demonstration
- Siren or [siren video \(https://www.youtube.com/watch?v=6sFMnSNjVJQ\)](https://www.youtube.com/watch?v=6sFMnSNjVJQ)
- What I Wonder T-chart from Lesson 1.1: Sound Vibrations

#### Group

- Enough of the following for groups to build a variety of devices:
  - rubber bands
  - cardboard
  - tongue depressors
  - shoe boxes
  - spoons
  - paper plates
  - beans
  - rice
  - empty bottles
  - masking tape

#### Individual

- Science notebook

#### Teacher Use

- 1.1.R2: Performance Assessment Checklist from Lesson 1.1: Sound Vibrations

## 1.2 Communicate with Sounds



### Advance Preparation

1. Determine when and where students will test their devices. (Step 13 of Procedure) The area will need to be large enough for the devices to communicate over a distance, but not too large that the devices are all unsuccessful. The testing will also need to take place during a time when there are not many other noises occurring, like recess or lunch.
2. Collect the materials for groups to use to build their device. (rubber bands, masking tape, cardboard, tongue depressors, shoe boxes, spoons, paper plates/bowls/cups, beans, rice, empty bottles)
3. Review **1.1.R2: Performance Assessment Checklist** from Lesson 1.1: Sound Vibrations. (Step 14 of Procedure)

## 1.2 Communicate with Sounds



### Procedure

#### Part I

Engage (40 minutes)

*Explain that vibrating matter causes sound that can be used to communicate over a distance.*

1. Seat students at the carpet. Ask students to turn to a partner and answer the question from Lesson 1.1: Sound Vibrations, What causes sound? Have a couple of students share out their answers. Ask students how they know and have a couple of volunteers share their answers.
2. Replay the siren and ask students what questions have been answered about the sound of the siren (what causes the sound), what questions remain on the What I Wonder T-chart (Lesson 1.1: Sound Vibrations, Step 4 of Procedure), and what other questions they might now have; record these on the T-chart and discuss how they think they could answer these questions. Explain that they will be discussing why a siren has to be so loud, and then they will design and test devices that can communicate over a distance.
3. Show students a whistle; ask them where they have seen this before and what was it used for. Have a few students share out. Blow the whistle. *If you have students who are hard of hearing or deaf, have them touch the whistle as you blow it and let them know that the whistle is making a sound.* Ask each student to think about what is causing the sound they hear/feel. Then have students turn to their partner and share what they think is causing the whistle's sound. Now walk around the circle and blow the whistle in front each student so that they can see the ball vibrating inside the whistle. Have them once again turn to their partner and share what is causing the whistle's sound.
4. Blow softly and blow loudly. Ask students to think about what they notice about the sound. Have students share their observations with a partner. *If you have students who are hard of hearing or deaf, make sure that hearing students share that there is a sound and that is louder or softer depending on how you blow the whistle.* Reinforce the word *vibrate*, as well as the cause and effect relationship by having students state what caused the effect (*something moving back and forth very fast causes sound, blowing hard causes a loud sound, blowing soft causes a quieter sound*). (Refer to the Scaffolds for Cause and Effect on page 1.0.17 of the Introduction, or point to a cause and effect chart if displayed.) Ask students to come up with questions they might have about the whistle, and how it is similar to or different from what they observed in the previous lesson. Record their questions on the T-chart.
5. Ask students what whistles are used for (*communication*). Then ask whom the whistle is communicating with (*students on a playground, players on a field*). Show the siren or [siren video](#) again. Ask students what the siren is used for (*communicating an emergency*). Then ask whom the siren is communicating with (*cars, people on the street*). Ask students "What is the same about the way the siren and the whistle communicate?" (*They are loud.*) Ask students "Why are these sounds loud, and what would happen if they were quiet?" (*They are loud in order to communicate over a long distance; if they were quiet, people wouldn't be able to hear them.*) Let students know that sirens have both loud sounds and bright lights to communicate because some people cannot see well, and some people cannot hear well.

## 1.2 Communicate with Sounds



### Procedure

#### Part II

Explore Part A (40 minutes)

*Design a device that causes a loud sound to communicate over a distance.*

6. Begin by blowing the whistle and playing the siren. Ask students what caused each device to be able to communicate over a distance. Have a couple of students share out. (*Both items were loud enough to be heard from a distance.*)
7. Set up the scenario by asking students “What would happen if the siren of an ambulance was not working?” Ask students to discuss in their groups why this might be a problem. Discuss as a class and chart the group’s responses.
8. **Summarize the problem:** The siren is not working, so you need to help the medics so that they can drive safely through the streets to help someone who needs medical attention. **Present the challenge:** Design a device that makes a loud noise that you can use in your pretend ambulance to drive safely through the streets. Because of our materials, we can’t design a device as loud as a siren, but we can still create loud devices that can be used to communicate over a distance outdoors.
9. Show students the materials that they will be using for the investigation (rubber bands, cardboard, tongue depressors, shoe boxes, spoons, paper plates, beans, rice, empty bottles, etc.). As you introduce the materials that will be used, find a way to display the item, or a picture of it, with its name. This will provide a reference for students during their planning.
10. Pose the challenge to students again: **How can we design and test a device that causes a loud sound using these materials?** Let students know that they will be making the loudest sound they can with the materials they have, but that this sound would never be as loud as a real ambulance siren. Have students return to their seats and independently think about how they could use the materials to complete this task. In their notebook, have each student draw the design for their device.

## 1.2 Communicate with Sounds



### Procedure

#### Part III

Explore Part B (45 minutes)

*Design a device that causes a loud sound to communicate over a distance.*

11. Bring the students together. Ask them to describe the problem and the challenge outlined in the previous session.
12. Send students back to their groups. Have each student share their designs from Step 10 of Procedure in their group. Each group needs to decide on one design to construct. As they reach consensus, check in with each group to see their plans for the device they will be building and give feedback as needed.
13. Set the materials at a central location and have the getters bring materials to each group.
14. Give each group time to construct their device. ► As they work, use **1.1.R2: Performance Assessment Checklist** from Lesson 1.1: Sound Vibrations to make quick notes on how students are doing in all three dimensions. (Later, use the Grade 1 Sounds Instructional Rubric on pages 1.0.14–1.0.15 of the Introduction to determine each student’s level of understanding of DCI, CCC, and SEP.) 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.

#### TEACHER NOTE

The time needed for each group to construct their device may vary depending on the students’ comfort with constructing devices.



### Procedure

#### Part IV

Explain (45 minutes)

*Design a device that causes a loud sound to communicate over a distance.*

15. Bring the students together. Ask them to describe the problem and the challenge that their devices are meeting. Have students think-pair-share how to design a simple test to find out if their devices are effective—that they can be heard (communicate) over a distance. Take a few ideas and acknowledge them.
16. Bring the class outside to a field or blacktop area. Have each group set their device on the side, out of their hands and away from the other students. Line up the class on one side of the field. Send one group to the other side of the field to demonstrate their device. Have students give thumbs up if they can hear the sound. Repeat for each group.

## 1.2 Communicate with Sounds

17. After all groups have tested their device, ask if all the groups met their goal, to “design a device that causes a loud sound to communicate over a distance.” Some devices will be louder than others, and some may be too soft and not be heard at all. Explain that many times engineers do not meet their goal the first time they try and have to revise their design and try again; they learn from their mistakes. Then ask each group to discuss how their device was the same as and different from the other groups’ devices.
18. Encourage them to talk about cause and effect relationships. As in the previous lesson, ask students if they observed any patterns among all the devices. (Optional scaffold: “A pattern I observed is \_\_\_” or “I think this is a pattern because \_\_\_”) Through a guided discussion, reinforce the notion that vibrating matter causes sound and this pattern is repeated in every device they designed and built.
19. Demonstrate the siren for the class from the same location across the field. Bring students into a circle to think about whether their device communicated effectively, though not as loud, as the siren.

### TEACHER NOTE

Be sure the area you choose for students to demonstrate their devices does not have too much background or ambient noise and has lines or demarcations that allow all of the groups to demonstrate their device from the same distance.

Be sure to set up norms with your students before going outside. Suggested norms include using a different door than the recess door, meet and make a circle to review what will happen outside before beginning the activity, have students face away from the sun so that they can see.



### Procedure

#### Part V

Evaluate (25 minutes)

*Explain how a device causes a loud sound to communicate over a distance.*

20. Ask students to describe what they did in the last session. Have them explain the simple test they carried out (taking their devices outside and testing them one at a time) to gather evidence that vibrations in their devices caused sound to be heard over a distance, and what they observed. Have students discuss why they think some of the devices were louder than others and how they think they could make their devices even louder. For students who are exceeding expectations, introduce the notion of variables and ask what they think would happen if the string was longer or shorter or the drum was larger or smaller, for example. (If time permits, have the groups redesign their devices and test them again.)

## 1.2 Communicate with Sounds

21. Have each student draw the revised device their group came up with in their notebook and label the parts. Review the conventions of drawing and labeling models (e.g., using arrows to show movement, labeling with lines). In pairs, have students practice asking each other questions about their models using these prompts:

- › *What does your model explain?*
- › *What does this part show?*
- › *How could you show \_\_\_ another way?*

Have students discuss how their drawings (models) help them understand how their devices work and also help them communicate this to others.

22. Using their model from the previous step, have students explain in writing what caused their device to be able to communicate across a distance. (Optional scaffold: “The \_\_\_ causes \_\_\_” or “The effect of \_\_\_ is \_\_\_” or “\_\_\_ causes \_\_\_”). Discuss why scientists and engineers look for cause and effect relationships. Ask students how the cause and effect relationship helped them understand more about a phenomenon.

23. Have students explain why ambulances have sirens and how they think the siren might cause the sound. Revisit the What I Wonder T-Chart with the list of questions from Lesson 1.1: Sound Vibrations, Steps 3 and 4 of Procedure, and discuss which questions have been answered. Continue adding, revising, and connecting to their learning by recording what they found out in this lesson 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.

### TEACHER NOTE

► Collect the notebooks at the end of the session and review students’ answers to the question: **What caused their device to be able to communicate over a distance?** (See Step 22 of the Procedure.)

Expected student’s response: *\_\_\_ vibrated in my device to cause the sound, which could be heard across the field. Ambulances have sirens because they have to communicate an emergency to people on the street or in other cars, and something must vibrate inside the siren to make the sound.*

Students may also write about how they made the sound louder, but this is not assessed at this grade.

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 Student Support Strategies on pages 1.0.16–1.0.18 of the Introduction.

# Appendix 1.2

## Communicate with Sounds

### Next Generation Science Standards (NGSS)

This lesson is building toward:

PERFORMANCE EXPECTATIONS (PE)	
<b>1-PS4-1</b>	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. <i>[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.]</i>
<b>1-PS4-4</b>	Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.* <i>[Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones,” and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]</i>
<b>K-2-ETS1-1</b>	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.

\* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

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.

## Appendix 1.2

### DISCIPLINARY CORE IDEAS (DCI)

#### PS4.A: Wave Properties

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

#### PS4.C: Information Technologies and Instrumentation

- People use a variety of devices to communicate (send and receive information) over long distances. (1-PS4-4)

#### ETS1.A: Defining and Delimiting Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problem.

### CROSCUTTING 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.

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## Common Core State Standards (CCSS)

### CCSS ELA SPEAKING & LISTENING

#### CCSS.ELA-LITERACY.SL.1.1.B

Build on others' talk in conversations by responding to the comments of others through multiple exchanges.

#### CCSS.ELA-LITERACY.SL.1.5

Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

### 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-LITERACY.W.1.8** With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

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# Appendix 1.2

## California English Language Development (ELD) Standards

CA ELD		
Part 1.1.3: Offering and supporting opinions and negotiating with others in communicative exchanges		
EMERGING	EXPANDING	BRIDGING
<p><b>P1.1.3</b> Offer opinions and ideas in conversations using a small set of learned phrases (e.g., <i>I think X</i>), as well as open responses in order to gain and/or hold the floor.</p>	<p><b>P1.1.3</b> Offer opinions and negotiate with others in conversations using an expanded set of learned phrases (e.g., <i>I think/don't think X. I agree with X</i>), as well as open responses in order to gain and/or hold the floor, elaborate on an idea, and so on.</p>	<p><b>P1.1.3</b> Offer opinions and negotiate with others in conversations using an expanded set of learned phrases (e.g., <i>I think/don't think X. I agree with X</i>), and open responses in order to gain and/or hold the floor, elaborate on an idea, provide different opinions, and so on.</p>
<p>In addition to the standard above, you may find that you touch on the following standards in this lesson as well:</p> <p><b>P1.1.1:</b> Exchanging information and ideas with others through oral collaborative conversations on a range of social and academic topics</p> <p><b>P1.1.5:</b> Listening actively to spoken English in a range of social and academic contexts</p> <p><b>P1.1.10:</b> Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology</p> <p><b>P1.1.11:</b> Supporting own opinions and evaluating others' opinions in speaking and writing</p>		

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## Anchoring Phenomenon

Emergency sirens make loud sounds.



## Lesson Concept

Plan and conduct an investigation to provide evidence that **sound causes matter to vibrate**.



## Investigative Phenomenon

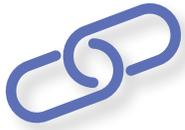
Sound causes matter to vibrate.



## Standards

Refer to Appendix 1.3 for NGSS, CCSS (ELA), and California ELD Standards.

## 1.3 See Sounds



### Storyline Link

This is the third lesson in the learning sequence. In the previous two lessons students explored the idea that vibrations cause sound. They also designed, built, and tested a device that used sound to communicate over a distance. This lesson builds on students' prior experience planning investigations and observing cause and effect relationships; students explore sound causing matter to vibrate, which completes the cause and effect relationship between sound and vibrations.

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

270 minutes

Part I	10 minutes	(Engage)
	35 minutes	(Explore Part A)
Part II	45 minutes	(Explore Part B)
Part III	45 minutes	(Explain)
Part IV	45 minutes	(Elaborate)
Part V	45 minutes	(Evaluate)
Part V	45 minutes	(Extend)

## 1.3 See Sounds



### Materials

#### Whole Class

- Speaker with the ability to play music from your computer
- Large bowl with plastic wrap over it (see 1.3.R1: How to Make a Sprinkle Dancing Bowl)
- Handful of rice or sprinkles or salt
- Song (preferably one with a strong beat)
- What I Wonder T-chart from Lesson 1.1: Sound Vibrations
- Investigation Planning chart from Lesson 1.1: Sound Vibrations

#### Group

- Small drum (a small pot works well).
- 2 large pieces of paper (chart or construction) or large whiteboard
- Tuning Fork
- Cup or bowl (see 1.3.R1: How to Make a Sprinkle Dancing Bowl)
- Rubber band that fits around the cup or bowl
- Plastic wrap
- Colored sprinkles or salt.
- Large plate or tray (to catch the sprinkles/salt)
- Chart paper or large piece of construction paper

#### Individual

- Science notebook

#### Teacher Use

- 1.3.R1: How to Make a Sprinkle Dancing Bowl
- 1.1.R2: Performance Assessment Checklist from Lesson 1.1: Sound Vibrations

## 1.3 See Sounds



### Advance Preparation

1. Choose a song to play in the Engage portion of the lesson. Test the song on the speaker to make sure it makes the rice move enough. A song with a strong beat is better.
2. Construct a large dancing bowl for the classroom demo and smaller dancing bowls for each group. (See **1.3.R1: How to Make a Sprinkle Dancing Bowl**).

Note: Rice, sprinkles, and salt are interchangeable in this investigation. However, the rice moves well with the speaker and is easier to see for the whole class demonstration, but does not move as well with the tuning fork or drum. Sprinkles or salt work better in the stations.

3. Choose a place in the room to display the science words for this lesson.
4. Inform your colleagues next door that you will be playing loud music for a few minutes.
5. Review **1.1.R2: Performance Assessment Checklist** from Lesson 1.1: Sound Vibrations.

## 1.3 See Sounds



### Procedure

#### Part I

Engage (10 minutes)

Observe that *sound causes matter to vibrate*.

1. Ask students to answer the focus question from lesson 1, “What causes sound?” Have a few students share out their responses.

#### TEACHER NOTE

Student responses may include their use of senses to hear sound and that vibrating matter causes sound from Lesson 1.1: Sound Vibrations. They may also share ideas about how sound is used to communicate over a distance from Lesson 1.2: Communicate with Sounds.

2. Seat students in an area where they can all easily see the speaker, preferably in a circle with the speaker in the middle. Introduce the speaker, asking students if anyone knows what the device is and what it is used for. If no one knows that it is a speaker, briefly introduce the device and explain what we use it for.
3. Put the large bowl next to the speaker and add rice on top of the plastic, at the center. Ask students to make predictions, drawing on prior experiences, about what they might observe or what will happen when you play music. Have students share their predictions with a partner and choose a few groups to report out.
4. Begin to play music through the speaker. *If you have students who are hard of hearing or deaf, let them know when the speaker is on. (Ideally you would use a speaker that has a small light that turns on when the speaker is on, and a scale of lights as it gets louder.)* Have students closely observe what is happening. After students have observed for a few minutes, have them record their observations in their notebook using drawings and words. Ask students to use the following sentence frame: I saw \_\_\_ when the speaker began to play music.

#### Explore Part A (35 minutes)

*Plan and conduct an investigation to provide evidence that sound causes matter to vibrate.*

5. Ask students what questions they have about what they just observed. Add questions from the group to the What I Wonder T-chart from Lesson 1.1: Sound Vibrations. (At least one student should ask “Why did [what caused] the rice move on top of the bowl next to the speaker?”)
6. Go through the class questions together. Ask students to show thumbs up if they think the question can be answered by doing a science investigation. Ask students to give thumbs down if they think the questions cannot be answered with a science investigation. Circle the

## 1.3 See Sounds

questions that students identify as being able to be answered with a science investigation. This should narrow the list of possible questions to investigate. Help students narrow down which question on the list they would like to investigate, leading them to “What caused the material, in this case rice, to move on top of the bowl?”

7. Ask students to turn to a partner and share their ideas for what they think caused the rice to move on top of the bowl next to the speaker. Have a few students share as a whole group and chart these ideas.
8. For each idea (claim) that students share, ask them to think about how they might test it. Have a few students share their tests. Ask what kind of evidence the test might give the class. Have a few students share. Let students know that we will be using two tests to gather evidence for our question: What caused the rice to move on top of the bowl next to the speaker?
9. Refer students to the Investigation Planning chart from Lesson 1.1: Sound Vibrations (Step 6 of Procedure). Ask them to read the three areas necessary to plan an investigation:
  - i. the question that we are trying to answer
  - ii. the materials we are using
  - iii. the data that we are collecting and how we are collecting it
10. Show students the materials that they will be using for the investigation (drum, bowl with plastic wrap over it, sprinkles or salt—see **1.3.R1: How to Make a Sprinkle Dancing Bowl**). As you introduce the materials that will be used, find a way to display the item, or a picture of it, with its name. This will provide a reference for students during their planning.
11. Have students independently think about how they could use the objects introduced in Step 10 of Procedure (drum, bowl with plastic wrap over it, sprinkles or salt) to answer the question, “How can we use the drum to make the sprinkles move on top of the bowl?”
12. Distribute a set of materials to each group. Have students stand, push in their chairs, and stand behind their chairs. While standing behind their chairs, have students talk to their group and verbalize a plan to answer this question, which should include what data they will be collecting. Give the groups about 5 minutes to talk through the plan. As groups are talking, be listening for a group or two that are discussing a plan that will help them answer the investigation question. (Using the drum to make the sprinkles jump without touching the bowl.)
13. Bring the class back together. Using the preselected groups that you identified during their work time in Step 12 of Procedure, have a couple of groups share out their verbal plan. If no group has thought about not touching the bowl while playing the drum, ask them to predict what would happen to the sprinkles if they played the drum close to but not touching the bowl. Have students share with a partner, then as a whole group.

As groups are sharing out, record a few key points for class reference. Here are some examples that might help scaffold the planning process for students:

## 1.3 See Sounds

- i. the question that we are trying to answer (What caused the sprinkles (or salt) to move on top of the bowl?)
  - ii. the materials we are using (drum, bowl with plastic wrap over it, sprinkles)
  - iii. the data that we are collecting and how we are collecting it (drawing what happened to the sprinkles when they played the drum; use of labels or writing could also be added)
14. Have each group get back together to finalize their investigation plans orally.
  15. Have students work individually to write their plan in their notebook.

### TEACHER NOTE

The purpose of having students work on their plan individually is that it provides an opportunity for you to see how each student is doing in their ability to plan investigations. While students are being scaffolded through the group conversations and the resulting key points on the board in Step 13 of Procedure, the plan students actually write up in their notebook will provide evidence for each student's development in this SEP.



## Procedure

### Part II

Explore Part B (45 minutes)

*Plan and conduct an investigation to provide evidence that sound causes matter to vibrate.*

16. Working with their same groups from the previous session, ask students to get out their notebooks with their plans for the investigation and share out what question they are investigating.
17. Distribute a set of materials to each group. Students should conduct their investigation based on their plans. Remind them to collect their data in their notebooks. While groups are working, circulate around the room and listen to the conversations the groups are having. Specifically listen for how students are describing the movement of the sprinkles and notice if anyone is using the word vibrate. Students should specifically be discussing what causes the movement to occur. Look at the data (drawing and writing) students are collecting in their notebook, noticing the patterns among the students' observations. ► Use **1.1.R2: Performance Assessment Checklist** from Lesson 1.1: Sound Vibrations to make quick notes on how students are doing in all three dimensions. (Later, use the Grade 1 Sounds Instructional Rubric on pages 1.0.14–1.0.15 of the Introduction to determine each student's level of understanding of DCI, CCC, and SEP.) As students explore, ask questions about what they see happening to cause a sound. Encourage students to use the sentence frames to explain the cause and effect relationship.

## 1.3 See Sounds



### Procedure

#### Part III

Explain (45 minutes)

*Construct an explanation that describes how sound causes matter to vibrate.*

18. Provide each group with a large piece of paper (chart paper or construction paper) or whiteboard. Have each group draw up a picture of the drum, bowl, and sprinkles, and ask students to label what is vibrating and what is causing the vibrations to happen. (The drum's sound caused the sprinkles to vibrate.)

#### TEACHER NOTE

Circulate as the groups work, looking at each group's drawing. Be sure to look for their labels and their explanation of the sound causing vibration. If there still seems to be some confusion for a group, look for another group who could share their model to help. These group models will serve as a consensus model, which gives another opportunity for students to further think about what they observed about the cause and effect relationship between sound and vibration.

19. Collect the materials and bring the class back together as a whole group on the carpet. Ask students what test they designed to gather information on what might cause the rice to move on top of the bowl next to the speaker. Have each group present their drawings and explain what they observed in their investigation. Ask students what causes the rice to move on top of the bowl. Ask how they know this. Give students time to provide feedback to each other as they present their models.
20. Ask students to think about what is similar about the effect of sounds from the drum. Lead a class discussion about the observable patterns in the effects of sound using the drum. Explain that events, like the moving rice, always have causes, and that identifying patterns helps us understand cause and effect relationships.
21. Ask students if they have more questions about what causes the rice to move on top of the bowl next to the speaker. Let them know that scientists always look for more data to understand how the things work, and they will be gathering more evidence through another investigation.

## 1.3 See Sounds



### Procedure

#### Part IV

#### Elaborate (45 minutes)

*Construct an explanation that describes how sound can make matter vibrate.*

22. Show students a tuning fork. Let them hear it, and briefly describe what it is used for. Add one or a picture of one to your science word wall.
23. Tell students that they will be gathering more evidence to explain what caused the rice to move on top of the bowl next to the speaker. Show students how to tap the tuning fork on the side of the table. Have them turn to a partner and explain what they can do with the tuning fork, the bowl, and the sprinkles, then share ideas as a class. (Make sure that students know not to touch the sprinkles with the tuning fork). Ask students to pay close attention to what the effect of the tuning fork is. Now distribute the materials to each group (tuning fork, bowl with plastic wrap on a tray, and sprinkles). Add a few sprinkles at the center of the plastic covering the bowl and instruct students to have each member of their group take a turn with the tuning fork. Once all students have had a turn, have them turn to a partner and explain what happened and why. Students might use the sentence frame:

The tuning fork caused the sprinkles to \_\_\_\_\_. I think this happened because \_\_\_\_\_. This is similar to the drum because \_\_\_\_\_.

You can also have students observe what happens to the sprinkles if they hum close to the plastic wrap.

24. Identify a couple of students who would be able to provide their explanation orally to the class. Have students compare what they hear from their classmates to what they wrote for their explanations.

#### TEACHER NOTE

As you look at their notebooks and listen to the group conversations, you are listening or looking for the idea that students recognize that the sound from the tuning fork caused the sprinkles or salt to jump (vibrate).

25. Bring the class back together. As the teacher, again, demonstrate by tapping the tuning fork on the side of the table and making the sprinkles jump. Ask for some students to come up and explain to the class what is happening. Once again, having students hear multiple explanations that are about the same observation may help add further clarity for students who are still developing their understanding or are still developing language to explain their thinking. To help deepen their understanding of the relationship between the sound of the tuning fork and the sprinkles jumping, have pairs of students act out (pantomime) the tuning fork making sound and the sprinkles vibrating.

## 1.3 See Sounds

26. After students have shared, have them record their observations of what happened in their notebook.



### Procedure

#### Part V

Evaluate (45 minutes)

*Construct an explanation that describes how sound can make matter vibrate.*

27. Seat students in an area where they can all easily see the speaker, preferably in a circle with the speaker in the middle. Ask students to recall the speaker from the beginning of this lesson. Explain that you are going to play the same music through the speaker again and once again ask them to observe what happens.
28. Have students return to their desks. They need to write a scientific explanation to answer the question “What caused the rice to move on top of the bowl next to the speaker?” Remind students that they need to use evidence from their investigations with the drum and sprinkles and the tuning forks. Provide students with the sentence frame:

The rice moves on top of the bowl next to the speaker because \_\_\_\_\_. My evidence for this from the drum and sprinkles is \_\_\_\_\_. My evidence for this from the tuning fork is \_\_\_\_\_.

29. Reintroduce the tabletop emergency siren that was used to demonstrate the anchoring phenomenon from lesson one. Provide an opportunity for students to feel the siren and the table near the siren, to see what observations they can make.

#### TEACHER NOTE

Feeling the siren does not build towards students understanding of how sirens communicate emergencies but serves as a link between the student ideas that sound causes vibrations and that vibrations cause sound.

30. Ask students to think about the anchoring phenomenon: *Emergency sirens make loud sounds.*

Ask students to discuss with a partner the answers to the following questions:

- › *What causes the siren to make sound?*
- › *What does the siren sound do?*

Ask students to write and/or draw a scientific explanation to answer the questions. Provide students with the following sentence stems, if needed:

- › *I think sirens \_\_\_\_\_.*
- › *My evidence for this is \_\_\_\_\_.*
- › *The sound \_\_\_\_\_.*

## 1.3 See Sounds

### TEACHER NOTE

Expected student responses may include that something inside the siren vibrates and makes a loud sound. Evidence for this is that the vibrating (rubber band, kalimba, spoons, tuning fork, drum, etc.), made sounds. The sound of the siren makes people move away and/or the sound of the siren makes other things vibrate. ► Use the Grade 1 Sounds Instructional Rubric on pages 1.0.14–1.0.15 of the Introduction to assess each student’s level with respect to DCIs, CCCs, and SEPs.

Revisit the T-chart with the list of questions from Lesson 1.1: Sound Vibrations, Steps 3 and 4 of Procedure, and discuss which questions have been answered. Continue adding, revising, and connecting to their learning by recording what they found out in this lesson under What I Found Out. Ask what they could do to find answers to their other questions. Depending on classroom constraints, available materials, and alignment with established learning goals, have students plan investigations to answer their other questions.



### Procedure

#### Part VI

Extend (45 minutes)

*Obtaining, evaluating, and communicating information using Informational text.*

31. At this time, it would be appropriate to have students interact with text to extend their understanding of sound. This can be done during their language arts time using reading strategies, such as close reading. Suggested books include the following:
  - › *What Makes Different Sounds?* by Lawrence Lowery, illustrated by Susan Dolesch  
Description: On their walk home from school, twins Jane and Jim explore why sounds can be startling (like sirens), soothing (like music), or mysterious (like eerie creaking in an empty house). By coming along, young readers of *What Makes Different Sounds?* can learn as the twins do.
  - › *Sound* by Delta Education  
Description: Students read about what causes sound, how sound travels, and how sounds differ. They learn how our voices and ears work to allow us to speak and hear. They discover how different types of musical instruments make sounds.

### References

Lowery, L. F. & Dolesch S. (Illustrator). (2012). *What Makes Different Sounds?* Arlington, VA: NSTA Kids. ISBN: 978-1-9369-5944-0

Delta Education. (2004). *Sound*. Delta Education. ISBN: 1-592-42377-9

## Toolbox Table of Contents

1.3.R1 How to Make a Sprinkle Dancing Bowl

1.3.13

## How to Make a Sprinkle Dancing Bowl

### Materials:

- Plastic bowl (or any unbreakable bowl)
- Plate or tray (to catch sprinkles that fall off the bowl)
- Plastic wrap
- Rubber band
- Sprinkles or salt



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

### Instructions:

- Stretch a piece of plastic wrap across the top of the bowl.
- Use a rubber band to hold the plastic wrap in place.
- Adjust the plastic wrap so it is as tight and as flat as possible with no wrinkles.
- Put the bowl onto a plate or tray to catch any sprinkles or salt that fall off.
- Add a few sprinkles or salt over the plastic at the center of the bowl.



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

## Next Generation Science Standards (NGSS)

This lesson is building toward:

### PERFORMANCE EXPECTATIONS (PE)

<b>1-PS4-1</b>	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. <b>[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.]</b>
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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 that can be tested.

- 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.

#### 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 1.3

### CROSSCUTTING CONCEPTS (CCC)

#### Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

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## Common Core State Standards (CCSS)

### CCSS ELA SPEAKING & LISTENING

#### CCSS.ELA-LITERACY.SL.1.1.B

Build on others’ talk in conversations by responding to the comments of others through multiple exchanges.

#### CCSS.ELA-LITERACY.SL.1.5

Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

### 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-LITERACY.W.1.8

With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.

### CCSS ELA READING: INFORMATIONAL TEXT

#### CCSS.ELA-LITERACY.RI.1.10

With prompting and support, read informational texts appropriately complex for grade 1.

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## Appendix 1.3

## California English Language Development (ELD) Standards

CA ELD		
<b>Part 1.1.5:</b> Listening actively to spoken English in a range of social and academic contexts		
EMERGING	EXPANDING	BRIDGING
<b>P1.1.5</b> Demonstrate active listening to read-alouds and oral presentations by asking and answering <i>yes-no</i> and <i>wh</i> -questions with oral sentence frames and substantial prompting and support.	<b>P1.1.5</b> Demonstrate active listening to read-alouds and oral presentations by asking and answering questions with oral sentence frames and occasional prompting and support.	<b>P1.1.5</b> Demonstrate active listening to read-alouds and oral presentations by asking and answering detailed questions with minimal prompting and light support.
<p>In addition to the standard above, you may find that you touch on the following standards in this lesson as well:</p> <p><b>P1.1.1:</b> Exchanging information and ideas with others through oral collaborative conversations on a range of social and academic topics</p> <p><b>P1.1.3:</b> Offering and supporting opinions and negotiating with others in communicative exchanges</p> <p><b>P1.1.10:</b> Writing literary and informational texts to present, describe, and explain ideas and information, using appropriate technology</p> <p><b>P1.1.11:</b> Supporting own opinions and evaluating others' opinions in speaking and writing</p>		

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