Sound
Lesson 6a: Vibrating Drums

Grade 1	**Length of lesson:** 35 minutes	**Placement of lesson in unit:** 6a of 7 lessons on sound
Unit central question: Why do we hear sound?		**Lesson focus question:** How do our ears help us hear sound?
Main learning goal: Vibrating air (sound) can make other objects vibrate. When vibrating air makes our eardrums vibrate, we hear sound.		
Science content storyline: When a soundmaker vibrates, it causes the air around it to vibrate. These vibrations move through the air away from the soundmaker. Some of the vibrations reach our ears and make our eardrums vibrate. Our eardrums send a message to our brains that these vibrations are sound.		
Ideal student response to the focus question: Vibrating air hits my eardrums and makes them vibrate. When my eardrums vibrate, I hear sound.		

Preparation

Materials Needed

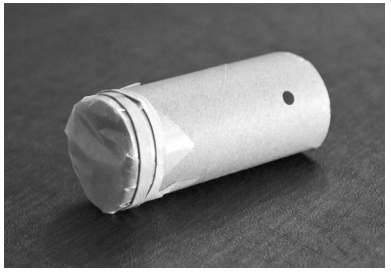
- Science notebooks
- Chart paper and markers
- *For kazoo (1 per student):*
  - 1 cardboard toilet-paper roll with a hole punched in the side (1 per student)
  - Wax paper
  - Rubber band
- Clucker (from lesson 2a)
- A few grains of rice
- Class drawing on chart paper from lesson 5b ("Where Did the Sound Go Today?")

Student Handouts

- 6.1 The Ear (1 per student)

Ahead of Time

- Review the Sound Content Background Document.
- Prepare handout 6.1 (The Ear) for display on a document reader.
- Assemble enough kazoos for each student based on the photo. Have students bring a toilet-paper roll to class or ask the school custodian (or a local hotel) to collect them for you.
  - Punch a hole in the side of each roll. Then place a square of wax paper over one end and secure it with a rubber band.
  - Use a Sharpie marker to write each student's name on a roll.



- Practice making sounds with the clucker to determine how close you'll need to be to the kazoo for the rice to vibrate and where to position the document camera. **Note:** For this activity, extend the string from the *outside* bottom of the clucker cup, not the inside.
- **ELL support:** Meet with ELL students in advance and introduce them to the lesson content, structure, materials, and activities so they know what's expected of them and can participate more fully in the lesson. Orient students to the handout and introduce the parts of the ear. Review key science ideas from previous lessons. It may also be helpful to review what a model is. Identify vocabulary terms in the lesson plan to review with students in advance, including *eardrum*, *vibrate/vibrations*, *sound detector*, *kazoo*, *represent*, and *characteristics*.

Lesson 6a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
2 min	**Link to previous lesson:** The teacher engages students in reviewing key ideas from the previous lesson about how sound travels to their ears.	• Sound begins at a soundmaker and travels away from it in all directions. We know this because everyone was able to hear a bell ring no matter where they were in the room.
1 min	**Lesson focus question:** The teacher introduces the focus question, *How do our ears help us hear sound?*	
5 min	**Setup for activity:** The teacher shows students an illustration of an ear and describes the different parts. Then the teacher elicits student ideas about whether eardrums vibrate.	• Vibrating air (sound) can make other objects vibrate, including our eardrums.
10 min	**Activity:** The teacher introduces a new soundmaker—a kazoo—and students predict whether it will detect sound when the teacher uses a clucker.	
10 min	**Follow-up to activity:** Using their kazoos as soundmakers, students gather more evidence that the air around a soundmaker vibrates and carries vibrations to their eardrums.	• The air around a soundmaker vibrates and carries vibrations to our eardrums.
6 min	**Synthesize/summarize today's lesson:** Students summarize what happens when vibrating air reaches their ears. Then they revise their class drawing from the previous lesson to include their new understandings.	• When a soundmaker vibrates, it causes the air around it to vibrate. These vibrations travel through the air to our ears and make our eardrums vibrate so we can hear sound.
1 min	**Link to next lesson:** The teacher announces that in the next lesson, students will read a story about a sad little soundmaker named Dingy and how they can make her happy.	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
2 min	**Link to Previous Lesson** **Synopsis:** The teacher engages students in reviewing key ideas from the previous lesson about how sound travels to their ears. **Main science idea(s):** • Sound begins at a soundmaker and travels away from it in all directions. We know this because everyone was able to hear a bell ring no matter where they were in the room.	Engage students in analyzing and interpreting data and observations. Engage students in making connections by synthesizing and summarizing key science ideas.	**Show slides 1 and 2.** Who can share something we learned last time about how sound travels to our ears?	We went to *[the gym, the cafeteria, the auditorium]* and rang a bell to test where the sound would go. We were sitting all around the bell. Some of us were close to the bell, and others were farther away. The sound went to everyone's ears, even if we were farther away. We all heard the bell ring. It went all the way over to the wall.	And where were you sitting in the room? What happened when the bell rang? Where did the sound go? How do you know? Where else did the sound go?

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
				It went down to the floor. It went up to the top of the stepladder. We could hear the sound no matter where we were in the room. Air. Because we caught air in bags all over our classroom, so we know that air is everywhere. When the bell rang, it vibrated and made the air vibrate too.	How do you know? What's your evidence? And what was between the bell and our ears? What evidence do we have that air was between the bell and our ears? What happened to the air when the bell rang? What happened to the vibrations? Where did they

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		Summarize key science ideas.	**Show slide 3.** So far we've learned that all soundmakers vibrate and make the air around them vibrate. These vibrations travel through the air to our ears, and we hear sound. Today we'll explore more ideas about how we hear sound.	The air carried the vibrations to our ears.	go?
1 min	**Lesson Focus Question** **Synopsis:** The teacher introduces the focus question, *How do our ears help us hear sound?*	Set the purpose with a focus question or goal statement.	**Show slide 4.** The focus question we'll think about in this lesson is *How do our ears help us hear sound?* Write this question in your science notebooks and draw a box around it. **NOTE TO TEACHER:** *Write the focus question on the board for students to refer to throughout the lesson.*		
5 min	**Setup for Activity** **Synopsis:** The teacher shows students an illustration of an ear and describes the different parts. Then the teacher elicits student ideas about		**Show slide 5.** **NOTE TO TEACHER:** *Distribute handout 6.1 (The Ear). In addition to the PowerPoint slide, you may want to display the handout on a document reader throughout the lesson.*		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
	whether eardrums vibrate. **Main science idea(s):** • Vibrating air (sound) can make other objects vibrate, including our eardrums.	Select content representations and models matched to the learning goal and engage students in their use. Ask questions to elicit student ideas and predictions.	This is a diagram of your ear. When a doctor looks inside your ear, he or she is looking at your ear canal and your eardrum. Can you find the eardrum on this picture? Do you think an eardrum is like the drums musicians use? **NOTE TO TEACHER:** *To make the analogy between an eardrum and a musical drum clearer for students, have a drum or two on hand for them to experiment with. Some ELL students may be more familiar with drums that they strike with their hands.* What do you know about drums? What does a drum look like? Are drums soundmakers?	Yes. It's at the end of the ear canal. A drum looks like a can or a barrel. There's a piece of leather or cloth stretched tight across the top. Yes! Drums make sounds when you hit them with a stick!	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			Do you think that drums vibrate? We don't want to hit our eardrums with a drumstick, do we? Ouch! Even though our eardrums aren't sound*makers*, they are sound *detectors*. Today's investigation will help us understand how our ears and eardrums help us hear sound. Are you ready to learn more about eardrums?	Bands have drums, and they make sounds. Yes, when you hit the top of a drum with a stick, the top bounces up and down.	
		Highlight key science ideas and focus question throughout. Make explicit links between science ideas and activities **before** the activity.			
10 min	**Activity** **Synopsis:** The teacher introduces a new soundmaker—a kazoo—and students predict whether it will detect sound when the teacher uses a clucker. **Main science idea(s):**	Select content representations and models matched to the learning goal and engage students in their use.	**Show slide 6.** Each of you has a new soundmaker on your table that we'll call a *kazoo*. This soundmaker is made from a cardboard-paper roll, a piece of wax paper, and a rubber band. We'll use our kazoos to help us learn more about sound and our ears so we can answer		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
	• Vibrating air (sound) can make other objects vibrate, including our eardrums.	Make explicit links between science ideas and activities **during** the activity. Highlight key science ideas and focus question throughout.	our focus question, *How do our ears help us hear sound?* Later in the lesson, we'll use our kazoos to *make* sound, but for this investigation, we'll only use them to *detect* sound. **Show slide 7.** At the beginning of this unit, we detected sounds that different soundmakers made. What is one way we detected sound? **ELL support:** Review key ideas about detecting sounds during the lesson preview so that ELL students will be prepared to participate more fully during the investigation. You may want to write key ideas from previous lessons on chart paper and post the chart where students can refer to it during the preview and the actual lesson. That's right! We used our ears and our sense of hearing to detect sound. How else did we detect sound?	We used our ears! Our sense of hearing. We used our hands. We felt vibrations when we touched a	What sense did we use? How did you detect sound with your hands?

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			What's another way we detected sound?	soundmaker. We used our eyes. We saw a soundmaker vibrating when it made a sound. We also saw other objects, like rice, vibrating when a soundmaker made a sound.	How did you detect sound with your eyes?
		Engage students	**NOTE TO TEACHER:** *Hold up the kazoo so everyone can see it.* As a sound detector, this kazoo has some characteristics that are a lot like the parts of an ear. **Show slide 8.** Look at the picture of an ear again. **NOTE TO TEACHER:** *In addition to the PowerPoint slide, continue displaying handout 6.1 (The Ear) on a document reader throughout the lesson.* What part of our new soundmaker is like an		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		in constructing explanations and arguments.	eardrum? What part of the ear is like the tube of the kazoo?	The paper on top. Because it stretches across the end of the tube. The tube going to the eardrum. The ear canal. Because sound goes through the tube to the wax paper, just like sound goes through an ear canal to our eardrums.	Why do you think the paper on top is like an eardrum? What is this tube called? Can you come up and point to what you're describing? Why do you think the tube of the kazoo is like an ear canal?
		Make explicit links between	**Show slide 9.** Next, I'm going to use the clucker to make a loud sound near one of these kazoos. To		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		science ideas and activities **during** the activity.	help us see the surface of the kazoo better, I'll project it with a document camera. First, I'll put a few grains of rice on top of the wax paper so we'll be able to see what's happening better when I make the sound. Remember, the wax paper is like our eardrums. **NOTE TO TEACHER:** *Use a document camera to project the surface of the kazoo. Position the camera to the side of the kazoo. Then add the grains of rice on top of the wax paper. Students should be able to see the rice and the wax paper clearly. Don't make the sound yet. Just have students make their predictions.* **Show slide 10.** What do you think will happen to the rice on the wax paper when I make a loud sound with the clucker? Keep in mind that when I make the sound, I won't touch the new soundmaker at all. **Turn and Talk:** Share your predictions with an elbow partner using the sentence starter on the slide: *I predict the rice will ____ because ____.*		
		Ask questions to elicit student ideas and predictions.			

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		Engage students in communicating in scientific ways.	Be prepared to share your predictions and reasons with the class. **Whole-class share-out:** Who would like to share your predictions and reasons? What do you think will happen to the rice when I make a sound with the clucker?	I think the rice will just sit there because it's too heavy to move. I think the rice will fly off the paper because the sound will blow it off. I think the rice will vibrate because the vibrating air will make it vibrate. When we put rice in the clucker cup in another lesson, the rice jumped up and down when the clucker made a sound. So I think the same thing will happen with the rice today.	*Questions to ask during the share-out:* • Have you ever seen that happen? • How do you know? • What is your evidence? • Does anyone agree or disagree? • Do you have any other ideas to add?
		Make explicit links between	Now I'm going to make a sound with the clucker. Watch the grains of rice on the top		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		science ideas and activities **during** the activity.	of the wax paper very closely to see what happens. Remember, when I make the sound, I won't be touching the top of the wax paper or the rice at all. **NOTE TO TEACHER:** *Have students move where they can clearly see the camera projection of the grains of rice on the wax paper.* To make sure we see what happens, I may have to make the sound several times. Scientists often repeat their investigations so they're sure about what they see. **ELL support:** Preview this activity with ELL students and allow them to get close enough to see the rice vibrating. **NOTE TO TEACHER:** *Stand about 2 feet from the cardboard-paper roll and aim the open end of the clucker cup directly at the roll. Make sure to extend the string from the outside bottom of the clucker cup, not from inside the cup. Practice this ahead of time so you know how close you need to be to the kazoo and where to position the document camera.* *Once you're in position, make a loud sound with the clucker. Remind students to look carefully at the rice grains on the wax paper.*		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		Engage students in analyzing and interpreting data and observations.	What happened to the rice? What did you see?	I saw the rice move.	How did the rice move?
				It moved really fast up and down.	What science word do we use for moving up and down quickly?
				Vibrate.	
			What do you think caused the rice to vibrate?	I think the sound made the rice move up and down.	Can you say this using the word *vibrate*?
				I think the sound made the rice vibrate.	Tell me more about how the sound made the rice vibrate.
				The clucker was vibrating, and then the air was vibrating, and that made the rice vibrate.	
			Do you think the wax paper was vibrating?	Yes, I think the air	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			NOTE TO TEACHER: *If some students don't think the rice vibrated, repeat the demonstration and have them come closer so they can see the vibrations.*	vibrations made the wax paper vibrate up and down too, and that made the rice vibrate. No. I couldn't see the wax paper vibrate. I think the sound vibrations in the air made the rice vibrate.	What is your evidence? So if the wax paper wasn't vibrating, what do you think made the rice vibrate?
10 min	**Follow-Up to Activity** **Synopsis:** Using their kazoos as soundmakers, students gather more evidence that the air around a soundmaker vibrates and carries vibrations to their eardrums. **Main science idea(s):** • The air around a soundmaker vibrates and carries vibrations to	Make explicit links between science ideas and activities **after** the activity. Select content representations and models matched to the learning goal and engage students	**Show slide 11.** Next, we'll use our kazoos as soundmakers and see if we can collect more evidence that will help us decide whether the wax paper vibrates when we make a sound. Put the open end of the cardboard-paper roll against your mouth and make a sound like an owl, "Hooo! Hooo!" **NOTE TO TEACHER:** *Give students a minute to make owl sounds with their kazoos.*		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
	our eardrums.	in their use.	What did you hear?	I heard the paper buzzing when I made a sound.	Why do you think the kazoo made a buzzing sound?
				When I went "Hooo! Hooo! the air in the tube vibrated.	What do you think caused the air to vibrate?
				The sound I made with my voice.	What happened to the wax paper?
				It vibrated when the air vibrated.	How do you know the wax paper vibrated?
				Because it made a buzzing sound.	
			So when you made a sound with the kazoo, you heard the wax paper make a sound, and you think that sound meant the paper was vibrating, right?		
			Show slide 12.		
			Let's see if we can collect more evidence		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			that the paper is vibrating. Pair up with an elbow partner and take turns making a sound with your kazoos. When one of you says, "Hooo! Hooo!" have your partner gently touch the wax paper and see if the paper vibrates. **NOTE TO TEACHER:** *Give pairs a minute or two to take turns making sounds with the kazoo and touching the wax paper.* **Whole-class discussion:** So what happened when one of you touched the wax paper while the other one made a sound? What do you think made the paper vibrate? Let's test that idea. We think the air from our mouths caused the wax paper to vibrate. Can you make the kazoo work when you hum with your lips closed? Let's find out. **NOTE TO TEACHER:** *Have students try humming into their kazoos.* What happened?	I could feel the wax paper vibrating. The air I blew into the tube. I could still hear the	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
				kazoo. No. In the tube.	So was any air coming out of your mouth with your lips closed? Then where was the air that was vibrating?
		Highlight key science ideas and focus question throughout.	So when the sound goes down the ear canal *[point to the cardboard-paper tube]*, the air in the tube carries it to the *eardrum [point to the wax paper]*, and the eardrum vibrates. **Show slide 13.** Look at this picture of the ear again. Remember, your eardrum is inside your ear. It's a piece of skin that covers the opening. You can't see your eardrums, but your doctor can when he or she uses a special instrument to look in your ears.		
		Ask questions to elicit student ideas and predictions. Engage students in analyzing and	How is the cardboard-paper roll like our ears? Why do you think the cardboard-paper roll	It has a tube that goes to the wax paper. The ear canal.	What is this tube called in our ears?

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
		interpreting data and observations.	is like our ear canals?	Because sound vibrations move through the tube like in our ears.	
			How is the wax paper like our ears?	It's like the skin that covers the opening inside our ears.	What part of our ears does the wax paper represent?
			Why do you think the wax paper is like our eardrums?	Our eardrums. Because it vibrates when sound vibrations hit it. Because it's stretched across the opening.	
			Show slide 14.		
		Highlight key science ideas and focus question throughout.	Who remembers the word *model*? We've used models before to help us understand how things work in real life. The paper tube and the wax paper are models of the ear canal and the eardrum. These models help us understand how our ears hear sound. **ELL support:** Be prepared to explicitly explain to ELL students why the cardboard-paper tube and the wax paper are		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			like the ear canal and the eardrum.		
6 min	**Synthesize/Summarize Today's Lesson** **Synopsis:** Students summarize what happens when vibrating air reaches their ears. Then they revise their class drawing from the previous lesson to include their new understandings. **Main science idea(s):** • When a soundmaker vibrates, it causes the air around it to vibrate. These vibrations travel through the air to our ears and make our eardrums vibrate so we can hear sound.	Engage students in making connections by synthesizing and summarizing key ideas. Highlight key science ideas and focus question throughout. Engage students in constructing explanations and arguments.	**Show slide 15.** Today's focus question is *How do our ears help us hear sound?* Let's use what we've learned from our investigations to answer this question. **Show slide 16.** Remember our class drawing on chart paper from last time that showed where sound went in the room when the bell rang? What happens when sound vibrations reach our ears? **Turn and Talk:** Share your ideas and evidence with an elbow partner. Be prepared to share with the class. **Whole-class share-out:** Let's hear your ideas about what happens when sound vibrations reach our ears. First, let's review what happens when a soundmaker makes a sound. Who can tell me what happens? **NOTE TO TEACHER:** *Display the class drawing you created on chart paper in*	The soundmaker starts to vibrate.	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			lesson 5b ("Where Did the Sound Go Today?"). The drawing should already show vibrations coming from the bell. Draw students' attention to the vibrations. What happens next? So the air all around the bell is vibrating. What did we draw between the bell and the students last time? **NOTE TO TEACHER:** *The drawing should already show the air vibrating around the bell. Point out the vibrations.* What happens next? And what happens when the sound vibrations reach our ears? Let's add an ear with its inside parts to our drawing to show what happens with the ear canal and the eardrum when sound reaches them.	The vibrations from the bell make the air around it vibrate. We wrote the word *air* and made wavy lines to show the air vibrating. The sound vibrations travel through the air to our ears. The vibrations go down the ear canal and make our eardrums vibrate, just like what happened with the kazoo!	

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
			NOTE TO TEACHER: *Add an ear, an ear canal, and an eardrum near the edge of the drawing.* What's missing from our drawing? OK, let's label the ear canal and the eardrum. **NOTE TO TEACHER:** *Add labels for the ear canal and eardrum on the drawing.* How could we show that the eardrum is vibrating? Who would like to come up and draw that on our picture? Now our drawing is more complete because it shows how the vibrations from the bell move through the air to our ears and then travel to our eardrums. Great job, everyone!	We need labels. You could add little lines coming from the eardrum.	
1 min	**Link to Next Lesson** **Synopsis:** The teacher announces that in the next lesson, students will read a story about a sad little	Summarize key science ideas.	**Show slide 17.** Today we used a kazoo model to explore how our ears help us hear sound. First, I made a loud sound with the clucker, and we saw how the sound vibrations traveled		

Time	Phase of Lesson and How the Science Content Storyline Develops	STeLLA Strategy	Teacher Talk and Questions	Anticipated Student Responses	Possible Probe/Challenge Questions
	soundmaker named Dingy and how they can make her happy.	Link science ideas to other science ideas.	from the clucker to the kazoo and made the rice grains vibrate on the wax paper. Then you made owl sounds with your kazoos to see whether the wax paper vibrates like our eardrums. Next time, we'll learn more about how our ears help us hear sound. We'll also read a story about a sad little soundmaker named Dingy and how we can make her happy.		