Sound
Lesson 4a: Sound Moves through Air

Grade 1	**Length of lesson:** 35 minutes	**Placement of lesson in unit:** 4a of 7 lessons on sound
Unit central question: Why do we hear sound?		**Lesson focus questions:** How does sound move from a soundmaker to our ears? What is our evidence?
Main learning goal: When something vibrates, it makes the air around it vibrate.		
Science content storyline: For us to hear sound, it must move from a vibrating object to our ears. All soundmakers vibrate and cause the air around them to vibrate. When these vibrations move through the air and reach our ears, we hear sound.		
Ideal student response to the focus questions: Soundmakers vibrate when they make a sound. This makes the air around them vibrate too. When these vibrations move through the air to my ears, I can hear sound.		

Preparation

Materials Needed
- Science notebooks
- Chart paper and markers
- 1 tuning fork (from lesson 2b)
- 1 clucker (from lesson 2a)
- A few grains of rice (from lesson 2a, optional extension activity)
- 4 gallon-sized zip-seal plastic bags

Student Handouts
- 3.1 Sound on the Move (from lesson 3)

Ahead of Time
- Review the Sound Content Background Document.
- **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. In particular, introduce the concept that air, while invisible, is all around us. Not only can it be felt, but it also plays a critical role in our ability to hear sound. This concept will be difficult for some students to understand. Also explain how the vibrations created with the Slinky model are like the vibrations created with the clucker. Review the words *model*, *tuning fork*, *vibrate/vibrations*, and *Slinky*.
- **Note:** Make some extra copies of handout 3.1 in case some students need a clean copy to revise their drawings.

Lesson 4a General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
5 min	**Link to previous lesson:** The teacher engages students in reviewing how sound moves from a soundmaker to their ears.	• For us to hear sound, it must move from a vibrating object to our ears.
1 min	**Lesson focus questions:** The teacher introduces the focus questions, *How does sound move from a soundmaker to our ears? What is our evidence?*	
5 min	**Setup for activity:** The teacher elicits ideas from students about what is vibrating in the space between a soundmaker and their ears.	• For us to hear sound, it must move from a vibrating object to our ears.
10 min	**Activity:** Students investigate what is vibrating in the space between a soundmaker and their ears, and they gather evidence that air occupies this space.	• For us to hear sound, it must move from a vibrating object to our ears. • All soundmakers vibrate and cause the air around them to vibrate. When these vibrations move through the air and reach our ears, we hear sound.
5 min	**Follow-up to activity:** Students answer the focus questions by using what they learned about air to explain how sound moves from a soundmaker to their ears.	
8 min	**Synthesize/summarize today's lesson:** The teacher engages students in summarizing what happens when sound moves from a tuning fork to their ears. Then students revise their drawings from the previous lesson to better show how vibrations move through the air to their ears.	• In science, our ideas change as we learn more.
1 min	**Link to next lesson:** The teacher summarizes key science ideas from the lesson and previews the next lesson in which students watch a video clip that show what happens to the air when a tuning fork vibrates.	

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5 min	**Link to Previous Lesson** **Synopsis:** The teacher engages students in reviewing how sound moves from a soundmaker to their ears. **Main science idea(s):** • For us to hear sound, it must move from a vibrating object to our ears.	Ask questions to elicit student ideas and predictions. Ask questions to probe student ideas and predictions. Ask questions to challenge student thinking. Engage students in constructing explanations and arguments.	**Show slides 1 and 2.** **NOTE TO TEACHER:** *Begin the lesson by striking a tuning fork on the bottom of your shoe or on the palm of your hand. Then engage students in telling a sound story.* Who can tell me what this tuning fork is doing? How does the sound move from the tuning fork to our ears? In our last lesson, I made my hand vibrate like a tuning fork while I was holding one end of a Slinky. Who can remind us what happened when I did that?	It's making a sound. It's vibrating. The tuning fork is moving back and forth really fast. When a tuning fork makes a sound, it vibrates, and the vibrations move from the tuning fork to our ears. When the vibrations reach our ears, we hear sound. Your hand made	How is it making a sound? What do you mean by "vibrating"?

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				the Slinky vibrate.	What did you see when the Slinky vibrated? What did the vibrations do?
			Did the whole Slinky move to the other side? **ELL support:** During the lesson preview, you may want to repeat this activity with ELL students and review their drawings. When the tuning fork vibrated earlier, could we see the vibrations moving in the space between the tuning fork and our ears? So we couldn't see the vibrations, but did the Slinky model help us imagine how they traveled from the tuning fork to our ears?	We saw the vibrations move from one end of the Slinky to the other end. No, only the vibrations moved to the other side. No. Yes!	
1 min	**Lesson Focus Questions** **Synopsis:** The teacher introduces the focus questions, *How does sound move from a soundmaker to our ears? What is our evidence?*		In our last lesson, we learned that when a soundmaker vibrates, it can make other things around it vibrate— like when my hand made the Slinky vibrate. Who can tell me what my hand represented? What did the Slinky represent? Today we'll think some more about how	A tuning fork. Vibrations moving from the tuning fork to our ears.	

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			sound moves from a soundmaker to our ears. **Show slide 3.** Our focus questions are *How does sound move from a soundmaker to our ears? What is our evidence?* Write these questions in your science notebooks and draw a box around them. **NOTE TO TEACHER:** *Write the focus questions on the board for students to refer to throughout the lesson.*		
		Set the purpose with a focus question or goal statement.			
5 min	**Setup for Activity** **Synopsis:** The teacher elicits ideas from students about what is vibrating in the space between a soundmaker and their ears. **Main science idea(s):** • For us to hear sound, it must move from a vibrating object to our ears.		Watch carefully to see what happens to rice in a clucker cup when I make a sound. **NOTE TO TEACHER:** *Quickly demonstrate the optional extension activity from lesson 2a. Place a few grains of rice in the clucker cup and pull the string. Students should be able to see rice move around (vibrate).* **Show slide 4.** So what happened to the rice when I made a sound with the clucker?	When you pulled the string, the rice jump around. Because the cup was vibrating.	Why did the rice jump around? How did the vibrating cup make
		Engage students in analyzing and interpreting data and observations. Engage students in constructing explanations and arguments.			

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					the rice move?
			Do you think the rice will move if the clucker isn't making a sound? **NOTE TO TEACHER:** *If students give mixed answers, demonstrate that the rice grains don't move if the clucker isn't vibrating.* So the clucker vibrated when it made a sound, and this made the rice move. This is a lot like what we saw with the Slinky, isn't it? When I made my hand move like a tuning fork, the vibrations went all the way through the Slinky from one end to the other. **ELL support:** Some ELL students may have a hard time understanding how the clucker vibrations and the Slinky vibrations are similar. You may want to briefly discuss this in the lesson preview. But Slinkies and rice don't really vibrate between a soundmaker and our ears, do they? **Show slide 5.**	The cup was touching the rice when it vibrated, so it made the rice bounce.	
		Make explicit links between	So what do you think is vibrating in the space between the tuning fork and our ears?		

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		science ideas and activities **before** the activity. Ask questions to elicit student ideas and predictions. Engages students in communicating in scientific ways.	**NOTE TO TEACHER:** *Point to the space between the tuning fork and your ear.* **Turn and Talk:** Discuss this question with an elbow partner and be ready to share with the class. **NOTE TO TEACHER:** *Since air is invisible and largely intangible, this connection may not be obvious to all students, so you may need to make this idea explicit.* **Whole-class share-out:** Who would like to share your ideas about what might be vibrating in the space between the tuning fork and our ears? Listen carefully to what your classmates share and be ready to agree or disagree, ask questions, or add on to their ideas.	The only thing between the tuning fork and our ears is air! I think the air is vibrating. I don't think there's anything between the tuning fork and my ears that can vibrate. I think the room is vibrating.	*Probe questions for all responses:* • Why do you think that? • What makes you think that? Does anyone disagree? Any other ideas? What do you mean

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			Great thinking, everyone! You shared a lot of different ideas about whether anything is vibrating in the space between the tuning fork and our ears. **Show slide 6.** Let's find out what's in this space by conducting a little experiment!		when you say "the room is vibrating"?
10 min	**Activity** **Synopsis:** Students investigate what is vibrating in the space between a soundmaker and their ears, and they gather evidence that air occupies this space. **Main science idea(s):** • For us to hear sound, it must move from a vibrating object to our ears. • All soundmakers vibrate and cause the air around them to vibrate. When these vibrations move through the air and reach our ears, we hear sound.		**NOTE TO TEACHER:** *If someone mentioned air in the previous discussion, begin the activity by saying, "Some of you think that air is vibrating between the tuning fork and our ears." If no one mentioned air, start the activity by saying, "Have you ever heard the word* air*?"* Do you think there is air in this room? Can you see it?	I think there's air in the room, but I can't see it. I don't think there's air in the room, but there's some outside. I feel air when the wind blows.	What is your evidence? Does anyone have a different idea about whether there's air in this

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					room?
		Engage students in analyzing and interpreting data and observations.	How do you know there's air in this room if you can't see it?	I think there's air in the room because we need air to breathe. Sometimes I can feel it blowing around the room when the air conditioner is on. I know there's air because I can breathe. I can grab some air!	
			OK, everyone take a deep breath. What did you breathe in?	Air. Oxygen.	
			Now take another breath and hold it. Can you feel the air in your chest when you hold your breath? Take another breath and hold it. Then put your hand in front of your mouth and breathe the air out! What do you feel?	The air I breathed out pushed on my hand!	

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			Where was the air when you took a deep breath?	It was right next to my nose and mouth.	Do you think that's the only place we can find air? Is it only next to our noses and mouths?
		Make explicit links between science ideas and activities **during** the activity.	Let's see if we can find some evidence that tells us where the air is in this room. Watch carefully what I do with this plastic bag. **NOTE TO TEACHER:** *Use a gallon-sized zip-seal plastic bag to collect some air from the room. Don't blow in the bag, but hold it open and move it through the air. Then quickly close and seal the bag. It should be pillow-like and filled with air.* **ELL support:** During the lesson preview, have ELL students conduct this experiment independently or in pairs. This may help them understand that air is "something," and that it conducts sound vibrations.	Yes, because that's where we got it.	
			Do you think there is air in this bag? **NOTE TO TEACHER:** *Show students the bag and let them feel it. They should realize that air is inside the bag even though they can't see it.*	Yes! The bag is puffy.	How do you know? What is your evidence? What other evidence could we

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					collect?
				We could squeeze the bag and feel that air is inside. If we opened the bag, maybe we could feel air come out like when we breathed out.	
			So we have some air in this bag. Do you think there is any air left in the room now?	Yes, there's more air in the room.	
					Where else could we find some more air in the room?
				Over by the door.	
			OK. Let's see if we can collect some more air. **NOTE TO TEACHER:** *Collect another bag of air where students think you can find some. Show students the air-filled bag and let a few of them feel it.* **ELL support:** Again have ELL students conduct this experiment independently or in pairs during the lesson preview to help them understand the concept that air is present and conducts sound vibrations.		
			Did we collect any more air in our second bag?	Yes!	
					How do you know?

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			Is there any air left in the room now?	The bag is filled up and puffy now. Yes. There's more air over by the window.	Why do you think there's air by the window?
			Do you think we could collect a third bag of air?	Because it might leak in even though the window's closed. Yes! One more bag.	Where should I sweep the bag this time?
			OK, watch carefully to see if I can catch more air. **NOTE TO TEACHER:** *Collect a third bag of air where students think you can find some. Then show them the air-filled bag and let a few students feel it.* **ELL support:** Again have ELL students conduct this experiment independently or in pairs during the lesson preview to help them understand the concept that air is present and conducts sound vibrations.	On top of the cabinet.	
			Did we collect a third bag of air?	Yes!	

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					How do you know it's air?
				Because it makes the bag puff up!	
					Do you have any other evidence?
				Yes. I can feel the air when I push on the bag.	
			Well, surely we've collected all of the air in the room now, right?	No! There's more!	
					There's more? What makes you think that?
				I'm still breathing air in and out, so there must be more.	
			So do you think there's enough air in the room to fill a fourth bag?	Yes!	
					Where do you think I could find some more air?
				Up high by the ceiling!	
					Why do you think there's air up near the ceiling?
				Because there's air everywhere in the room.	
					There's air everywhere? How could that be if we've gathered three bags of air already?
				There's a whole lot	

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				of air around the room.	
			All right, let's find out if there's more air in the room. Maybe I can catch more in another bag. **NOTE TO TEACHER:** *Collect a fourth bag of air where students think you can find some. Then show them the air-filled bag and let a few students feel it.* Did we capture any air this time?	Yes, there's air in the bag!	What is your evidence that there's air in this bag, too?
			We know there's air in all of the bags because they're puffy. Is that what you think?	It's big and puffy like the other bags. Yes.	
		Engage students in constructing explanations and arguments.	Can we see the air in the bags? So air is something we can't see, but we know it's there, don't we? How do we know it's in the bags if we can't actually see it? What evidence can you find with your senses?	No. It's invisible. I can see that the bags are puffy. I can feel that something is in the bag.	

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			Based on this evidence, do you think air is all around us in this room? Where is it? Show me. Is there any place in our room that doesn't have any air? So do you think there's air between the tuning fork and our ears? Let's check and see. I'm going to make a sound with the tuning fork, and I want you to wave your hand in the air and see if you feel any air when you hear the sound. **NOTE TO TEACHER:** *Tap the tuning fork on the bottom of your shoe or the palm of your hand; then have students wave their hands through the air to feel it swishing by.* Did you feel any air in front of you?	I can push on the bags and feel the air. Yes. It's up high. It's down low. It's over by the door. It's over by the window. No. Air is everywhere. Yes. Yes. I could feel the air go by my hand.	Where else could it be? How do you know?

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		Ask questions to elicit student ideas and predictions.	Did you hear the sound of the tuning fork? What do you think carried the sound from the tuning fork to your ears? What could be in the space between the tuning fork and your ears that carried the vibrations? So do we all agree that air is in the space between the tuning fork and our ears? What has to happen for us to hear the sound of the tuning fork? Do you think the air itself vibrates and carries the tuning-fork vibrations to our ears?	Yes! Air! The air carries the vibrations from the tuning fork to our ears! I could hear the sound of the tuning fork! Yes! The vibrations have to move through the air to our ears. Maybe. I don't know. Yes, because the sound gets to our ears.	Can you say this in a complete sentence? How do you know? What's your evidence?

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			In our next lesson, we'll find out more about whether air can vibrate and carry vibrations to our ears.		
5 min	**Follow-Up to Activity** **Synopsis:** Students answer the focus questions by using what they learned about air to explain how sound moves from a soundmaker to their ears. **Main science idea(s):** • For us to hear sound, it must move from a vibrating object to our ears. • All soundmakers vibrate and cause the air around them to vibrate. When these vibrations move through the air and reach our ears, we hear sound.	Highlight key science ideas and focus question throughout. Make explicit links between science ideas and activities **after** the activity. Engage students in constructing explanations and arguments.	**Show slide 7.** Our focus questions for today's lesson are *How does sound move from a soundmaker to our ears? What is our evidence?* **Turn and Talk:** Pair up with an elbow partner and use what you learned about air today to answer these questions. Share your ideas and then write your answers in your science notebooks. Remember to use the words *vibrate* and *vibrations* in your explanations. And be prepared to share your ideas with the class. **ELL support:** During the lesson preview, give ELL students an opportunity to practice explaining how they think sound moves from the tuning fork to their ears. Or you could have them name one question they have about how sound moves. **NOTE TO TEACHER:** *As pairs work together on their answers, listen to students' explanations and encourage them to use the word* vibrate *or* vibration*s. You should hear students saying that the air carries the vibrations from a soundmaker to their ears.* **Whole-class share-out:** Let's hear your ideas for answering today's focus questions. Who		

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			would like to share how you think sound moves from a soundmaker to our ears? **NOTE TO TEACHER:** *During this share-out, record students' responses on chart paper. Use this opportunity to assess students' understandings of the science content so you can build on key ideas or modify your approach in upcoming lessons.*	The air is in the space between the soundmaker and our ears. The air carries the sound to our ears. The air carries the vibrations to our ears? The vibrations move from the soundmaker through the air to our ears. When you hit the tuning fork, the vibrations moved through the air to our ears, and we could hear the sound.	How does sound get to our ears? What does the air do? Can you use the word *vibrations* in your answer? How do the vibrations move? How do you know? What's your evidence?
8 min	**Synthesize/Summarize Today's Lesson**	Select content	**Show slide 8.** Let's review our drawings from last time and		

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	Synopsis: The teacher engages students in summarizing what happens when sound moves from a tuning fork to their ears. Then students revise their drawings from the previous lesson to better show how vibrations move through the air to their ears. **Main science idea(s):** • In science, our ideas change as we learn more.	representations and models matched to the learning goal and engage students in their use.	talk about how we might change them to show what we learned about air today. Please find your handouts from the previous lesson. **NOTE TO TEACHER:** *On a document reader, project a blank copy of handout 3.1 (Sound on the Move) from lesson 3 and ask students to locate their own copies. Make a class drawing on the projected copy of the handout based on students' responses. Students can refer to the class drawing as they revise their own drawings. You could also revise the drawing collectively over time or create a class drawing on chart paper and post it on the wall.* What happens here, at the tuning fork? **NOTE TO TEACHER:** *Point to the tuning fork on the handout.* How can we make the tuning fork look like it's vibrating? Did anyone do that on your drawing last time? **NOTE TO TEACHER:** *On your copy of the handout, draw lines around the tuning fork to show it vibrating.* What happens in this space between the tuning fork and the ear?	It vibrates. The tuning fork vibrates. We can put little lines vibrating or moving back and forth around the tuning fork.	What do you mean by "it"? Can you show me?

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		Select content representations and models matched to the learning goal and engage students in their use.	**NOTE TO TEACHER:** *Point to the space between the tuning fork and the ear on the handout.* How can we show the vibrations moving through the air to our ears? **NOTE TO TEACHER:** *On your copy of the handout, draw wavy or squiggly lines in the space between the tuning fork and the ear to represent vibrations.* Then what happens here, at the ear? **NOTE TO TEACHER:** *Point to the ear on the handout.* When you made your drawings last time, you knew a little about how sound moves from the tuning fork to our ears. But now you know that sound moves through the air to our ears. In science, we get to change or add to our ideas when we learn more about something we're investigating. That doesn't always mean our ideas were wrong at first. It just means that we have more information and evidence. **Show slide 9.**	The vibrations move through it. They move through the air. The air vibrates. We could draw wavy or squiggly lines moving from the tuning fork to the ear. The ear hears sound.	What are the vibrations moving through? What does the air do?

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			Now I'd like you to change or add to your drawings from last time to show what you've learned about how sound vibrations move through the air to our ears. Think about what's missing from your drawings. What could we add or change so they answer our focus questions better? OK, take a few minutes to make any changes to your drawings that you think will make them better or more accurate. Be prepared to share your drawings with the class. **NOTE TO TEACHER:** *Give students 2–3 minutes to revise their drawings using use a pencil. Have some extra copies of the handout available for students who may need a clean copy to revise their drawings or make new ones. Students should add something to indicate that air is in the space between the tuning fork and the ear. One way they could do this is to write the word* air *in the space and/or draw dots to represent the air. If students draw dots, make sure they label them.* **Individual work time.**	I don't have air in my picture. I could add the word *air*.	How would you show air in your drawing?

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			Whole-class share-out: Who would like to share how you changed your drawing to show what you learned about air today? **NOTE TO TEACHER:** *You may want to display students' drawings on a document reader as students explain them.* What other changes did you make to your drawings? What did you learn today that helped you make these changes to your drawings?	I added lines around the tuning fork to show the vibrations in the air. I added air to my picture. I learned that there is air in the room. I saw the bag puff up with air. I felt the air in the bag.	How did you show air in your picture?
1 min	**Link to Next Lesson** **Synopsis:** The teacher summarizes key science ideas from the lesson and previews the next lesson in which students watch a video clip that show what happens to the air when a tuning fork vibrates.	Summarize key science ideas. Link science ideas to other	**Show slide 10.** Today we learned that instead of a Slinky, there's air in the space between a soundmaker and our ears. We also learned that when soundmakers vibrate, the vibrations travel through the air to our ears, and we hear sound. **Show slide 11.** Next time, we'll watch a video that shows what happens to the air between the tuning		

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		science ideas.	fork and our ears when the tuning fork vibrates.		