Sound
Lesson 3: Sound on the Move

Grade 1	**Length of lesson:** 30 minutes	**Placement of lesson in unit:** 3 of 7 lessons on sound
Unit central question: Why do we hear sound?		**Lesson focus question:** How does sound move from a vibrating object to our ears?
Main learning goal: Vibrating objects can make other objects vibrate.		
Science content storyline: When a soundmaker vibrates, it can make objects around it vibrate. This sets up a repeating pattern of vibrations that move through the air and carry the sound from the soundmaker to our ears. We can use lines to represent this repeating pattern.		
Ideal student response to the focus question: When a soundmaker vibrates, it can make the objects around it vibrate too. These vibrations move through the air and carry the sound from the soundmaker to our ears.		

Preparation

Materials Needed
- Science notebooks
- Chart paper and markers
- 1 extra-long Slinky
- 1 tuning fork (from lesson 2b)

Student Handouts
- 3.1 Sound on the Move (1 per student)

Ahead of Time
- Review the Sound Content Background Document.
- Watch the YouTube video (*Longitudinal Waves on a Slinky*) at https://www.youtube.com/watch?v=GIkeGBXqWW0 for an example of how to make vibrations with a Slinky.
- **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. Also orient students to the handout and show them how to complete it. Make sure students understand what a model is. Explain that the ruler in lesson 1a was a kind of model because students were investigating what would happen they plucked it. Other soundmakers they investigated were also different kinds of models. Give students time to explore the Slinky model so they understand how it works and what they're expected to do with it. Students may not understand how the parts of the model relate to the tuning fork and the human ear, so be explicit about what their hands represent, what the Slinky represents, and what the student at the other end of the Slinky represents. Identify words in the lesson plan to review with students in advance, including *model* and *Slinky*. Also review the words *tuning fork* and *vibrate/vibrations*.

Lesson 3 General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
3 min	**Unit central question and link to previous lessons:** The teacher reviews the unit central question, *Why do we hear sound?* and elicits ideas and evidence from students based on previous investigations.	• If an object produces a sound, it must be vibrating. Sometimes we can see a soundmaker vibrate, and sometimes we can't. • Even if we can't see the vibrations, we can gather additional evidence that will help us determine whether a soundmaker is vibrating. For example, we may be able to feel an object vibrate or see other objects move or vibrate when the soundmaker touches them.
1 min	**Lesson focus question:** The teacher introduces the focus question, *How does sound move from a vibrating object to our ears?*	
6 min	**Setup for activity:** Students pair up and predict how sound moves from a tuning fork to their ears. Then students share their ideas with the class and draw pictures to illustrate their predictions.	• Sound moves from a vibrating soundmaker to other places, like our ears.
10 min	**Activity:** Using a Slinky model, the teacher demonstrates for students how sound vibrations move from a tuning fork to their ears. Then students share their observations and draw new pictures to illustrate what they saw.	• The vibrations of a soundmaker can make objects around it vibrate. This sets up a repeating pattern of vibrations that move through the air and carry the sound from the soundmaker to our ears. We can use lines to represent this repeating pattern of vibrations.
4 min	**Follow-up to activity:** Students share their revised drawings with a partner and explain how they think sound moves from the tuning fork to their ears.	
4 min	**Synthesize/summarize today's lesson:** Students answer the focus question by sharing a sound story that describes how sound moves from a tuning fork to their ears.	
2 min	**Link to next lesson:** The teacher previews the next lesson by challenging students to think about how sound moves from a tuning fork to their ears without a Slinky.	

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3 min	**Unit Central Question and Link to Previous Lessons** **Synopsis:** The teacher reviews the unit central question, *Why do we hear sound?* and elicits ideas and evidence from students based on previous investigations. **Main science idea(s):** • If an object produces a sound, it must be vibrating. Sometimes we can see a soundmaker vibrate, and sometimes we can't • Even if we can't see the vibrations, we can gather additional evidence that will help us determine whether a soundmaker is vibrating. For example, we may be able to feel an object vibrate or see other objects move or vibrate when the soundmaker touches them.	Ask questions to probe student ideas and predictions. Ask questions to challenge student thinking.	**Show slides 1 and 2.** In this unit on sound, the big question we're trying to answer is *Why do we hear sound?* We've already learned about some important ideas that can help us begin to answer this question. **Show slide 3.** What have we learned so far about sound? What evidence have we found?	Soundmakers make sounds by vibrating back and forth really fast. I could see the soundmakers vibrate in our investigations. I could feel the soundmakers vibrate. I could hear sounds. Sometimes we can see an object vibrating, and sometimes we can't.	*Questions to ask:* • How did you find that out? What's your evidence? • Where did you see/hear/feel the vibrations? • What was vibrating? • What did the vibrating soundmaker do? • Can you always see/hear/feel the vibrations? • If you can't always see the vibrations, how do you know that something is vibrating? • Tell me more about what you

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				Soundmakers can make other things move when they vibrate, like when the clucker made the rice in the cup jump around.	saw or felt. • Does someone have different evidence or ideas?
1 min	**Lesson Focus Question** **Synopsis:** The teacher introduces the focus question, *How does sound move from a vibrating object to our ears?*	Set the purpose with a focus question or goal statement.	**Show slide 4.** Today we'll explore the focus question, *How does sound move from a vibrating object to our ears?* Write this question in your science notebooks and draw a box around it. **NOTE TO TEACHER:** *Write this question on the board for students to refer to throughout the lesson.* What we learn during today's lesson will help us gather more ideas and evidence to answer our unit central question, *Why do we hear sound?*		
6 min	**Setup for Activity** **Synopsis:** Students pair up and predict how sound moves from a tuning fork to their ears. Then students share their ideas with the class and draw pictures to illustrate their predictions.	Ask questions to elicit student ideas and predictions.	**Show slide 5.** How do you think sound moves from a vibrating tuning fork to our ears? **NOTE TO TEACHER:** *Hold up a tuning fork; then tap it on the bottom of your shoe or the palm of your hand to make a sound.* **Turn and Talk (1–2 min):** Talk about this		

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	Main science idea(s): • Sound moves from a vibrating soundmaker to other places, like our ears.		questions with your elbow partner and make a prediction about how you think sound moves from a vibrating tuning fork to our ears. Be prepared to share your ideas with the class. **Whole-class share-out:** Who would like to share your ideas about how sound moves from a vibrating tuning fork to our ears? **Show slide 6.** Now I want you to draw a picture to show your predictions and ideas. **NOTE TO TEACHER:** *Distribute handout 3.1 (Sound on the Move) and go over the instructions with students.* Look at your handout. On the left side is a picture of a tuning fork, and on the right side is a picture of an ear. I'd like you to draw a picture that shows your predictions about how sound moves from the tuning fork to our ears. **NOTE TO TEACHER:** *Give students2–3 minutes to illustrate their ideas and predictions on the handout. If time allows, display a couple of student drawings on a document reader and have students explain their ideas.*		
		Make explicit links between science ideas and activities **before** the activity.			
10 min	**Activity** **Synopsis:** Using a Slinky model, the teacher	Highlight key science ideas and	**Show slide 7.** Scientists use models when they want to investigate something they can't see so they		

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	demonstrates for students how sound vibrations move from a tuning fork to their ears. Then students share their observations and draw new pictures to illustrate what they saw. **Main science idea(s):** • The vibrations of a soundmaker can make objects around it vibrate. This sets up a repeating pattern of vibrations that move through the air and carry the sound from the soundmaker to our ears. We can use lines to represent this repeating pattern of vibrations.	focus question throughout. Select content representations and models matched to the learning goal and engage students in their use.	can understand it better. Today we'll use a Slinky model to help us understand how a sound moves from a soundmaker to our ears. **ELL support:** ELL students may not be familiar with the concept of a scientific model and may associate it with a fashion model. Make sure to introduce this concept during the lesson preview. Explain that each of the soundmakers they used in previous lessons was a kind of model that helped them understand sounds and vibrations. Use their experiences with these soundmakers as a basis for explaining what a model is and how scientists use them to investigate how systems work. Have you ever played with a Slinky before? How does a Slinky work? What does it do? That's right! For our investigation, we're going to stretch out the Slinky and then make it vibrate like a tuning fork. **NOTE TO TEACHER:** *Ask a student volunteer to help you with this demonstration. Have the volunteer hold one end of a Slinky while you hold the other end. Tell the student to hold the end of the Slinky still and not let go as you stretch the other end across the floor. The extra-long Slinky will tangle easily, so it's important not to release the end once*	It stretches and then bounces back again.	

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			the Slinky is stretched. Stretch the Slinky enough so the coils are spread apart, but not so much it stretches out of shape. This is easiest to do sitting on the floor. Have the rest of the class gather around so they can see how the Slinky behaves. **ELL support:** ELL students will benefit from an explicit explanation of what the parts of the Slinky system represent. Your hand represents the end of the tuning fork when it vibrates, the Slinky represents the vibrations, and the student at the other end of the Slinky represents an ear. I want you to imagine that my hand is the end of a tuning fork when it's vibrating and making a sound. **NOTE TO TEACHER:** *You may want to inform students that the ends of a tuning fork are called* tines. What happens to a tuning fork when it makes a sound? What do we know?	It vibrates. It moves back and forth very quickly.	And what does that mean? But we didn't see the tuning fork vibrate, so how do we know it moves back and forth quickly?

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				We could feel it vibrating. **For optional extension activity:** It had to vibrate to make the water move.	
			So how should I move my hand to show it vibrating like the tuning fork?	You should move your hand back and forth really fast and make it shake.	What word do we use to describe something moving back and forth quickly?
		Make explicit links between science ideas and activities during the activity.	OK. I'll make my hand vibrate back and forth quickly. As I do this, imagine that our volunteer at the other end of the Slinky is an ear. Remember, we're trying to find out how sound moves from a soundmaker like a tuning fork to our ears. Watch the Slinky and get ready to describe how it behaves when my hand vibrates on this end. **NOTE TO TEACHER:** *Using an in-and-out motion, push the Slinky toward the student at the other end and then quickly pull it back. Do this repeatedly to set off a series of visible vibrations that travel from one end of the*	Vibrate.	

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			Slinky to the other. (See the YouTube video demonstration at https://www.youtube.com /watch?v=GIkeGBXqWW0.) Remind students to carefully watch how the Slinky behaves. Then ask the student volunteer the following questions. As I'm moving the Slinky forward and backward, what do you feel? Am I pushing your hand or pushing the Slinky? **Show slide 8.** **Turn and Talk:** Now I'd like everyone to turn to an elbow partner and describe what you saw when I was moving the Slinky back and forth. **Show slide 9.** **Whole-class share-out:** Who would like to share what you observed when I was moving the Slinky back and forth?	I can feel the Slinky vibrating against my hand. You're pushing the Slinky. Because the vibrations are traveling through the Slinky to my hand.	So why do you think you feel the vibrations in your hand if I'm pushing the Slinky?

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			NOTE TO TEACHER: *Listen carefully to students' responses to make sure they understand what you're asking them to describe.* **ELL support:** Demonstrate the Slinky model during the lesson preview and ask ELL students to describe what they observed to make sure they understand what they're being asked to describe.		
		Engage students in analyzing and interpreting data and observations.	Where did the vibrations start?	They started when your hand pushed the Slinky.	Can you describe how the vibrations moved down the Slinky?
			Where did the vibrations go?	They went down each part of the Slinky to the other end. The vibrations.	What moved down the Slinky?
			Where did the vibrations end up?	They moved from one end to the other end of the Slinky. They ended up on the other side of the Slinky, where *[student's name]* is.	
			Did the Slinky itself move down to the other		

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			end? What moved to the other end if the Slinky didn't? **Dialogue for the optional extension activity:** Do you remember when we put the vibrating tuning fork in the water? What happened to the water? **NOTE TO TEACHER:** *If you didn't conduct the optional extension activity in lesson 2b, skip these questions and modify the teacher talk on the following page.* Did all of the water splash out of the cup?	No. The Slinky stayed on the ground. The push went through the Slinky to the other end. It made the water splash around. Some of the water moved and then splashed out of the cup. No. The tuning fork made vibrations, and those moved across the water.	Any other ideas? Yes, it made the water splash around. But did the water itself move across the cup or just the vibrations it made? So what moved from the tuning fork across the water?

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			Now let's think about the Slinky again. Did the whole Slinky move to the other end when I pushed it?	No.	So what moved through the metal Slinky from one end to the other?
		Make explicit links between science ideas and activities **during** the activity. Highlight key science ideas and focus question throughout.	This pattern of vibrations moving from one end of the Slinky to the other is just like what happened with the vibrations when we put the tuning fork in the water. **NOTE TO TEACHER:** *Modify the teacher talk above you didn't conduct the optional extension activity in lesson 2b.* **Show slide 10.** So sound vibrations move through the air from a soundmaker to our ears. **NOTE TO TEACHER:** *Write this key science idea on the board and have students write it in their notebooks* On your handouts, draw another picture that shows a vibration traveling through the air from the tuning fork to the ear. **NOTE TO TEACHER:** *Give students a few*	A vibration moved from your hand to the student holding the other end of the Slinky.	

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			minutes to draw on their handouts. Their drawings don't need to be accurate at this point.		
4 min	**Follow-Up to Activity** **Synopsis:** Students share their revised drawings with a partner and explain how they think sound moves from the tuning fork to their ears. **Main science idea(s):** • The vibrations of a soundmaker can make objects around it vibrate. This sets up a repeating pattern of vibrations that move through the air and carry the sound from the soundmaker to our ears. We can use lines to represent this repeating pattern of vibrations.	Engage students in making connections by synthesizing and summarizing key science ideas.	During our investigation, we saw vibrations move from one end of the Slinky to the other end, even though the Slinky itself didn't move to the other end. **Show slide 11.** **Turn and Talk:** Share your new drawing with an elbow partner and explain how you think sound moves from the tuning fork to your ears. What did you draw between the tuning fork and the ear to show what happens? **NOTE TO TEACHER:** *Give pairs 2 minutes (1 minute each) to share their drawings and explanations. As they share, listen to their conversations and note whether students are using the term* vibrations *in their explanations.*		
4 min	**Synthesize/Summarize Today's Lesson** **Synopsis:** Students answer the focus question by sharing a sound story that describes how sound moves from a tuning fork to their ears.	Highlight key science ideas and <u>focus question</u> throughout. Engage students in making	**Show slide 12.** Today's focus question is *How does sound move from a vibrating object to our ears?* Let's create a sound story to answer this question. Make sure to use the word *vibrate*, *vibrating*, or *vibrations* when you talk about your ideas.		

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	Main science idea(s): • The vibrations of a soundmaker can make objects around it vibrate. This sets up a repeating pattern of vibrations that move through the air and carry the sound from the soundmaker to our ears. We can use lines to represent this repeating pattern of vibrations.	connections by synthesizing and summarizing key science ideas.	Who would like to create the first part of our sound story? What happens here, at the tuning fork? **NOTE TO TEACHER:** *Point to the tuning fork.* Who can add the middle part of our sound story? What happens between the tuning fork and our ears? **NOTE TO TEACHER:** *Point from the tuning fork to your ear.* Who can add the end of our sound story? What happens here, at the ear? **NOTE TO TEACHER:** *Point to your ear.* How did our Slinky model help you	The tuning fork vibrates to make a sound. We can hear the sound, so it must be vibrating. We can see the vibrations or feel them. The vibrations move from the tuning fork to our ears. Because we saw the vibrations move from one end of the Slinky to the other end. The vibrations hit our ears! We hear sound!	What evidence do you have that the tuning fork vibrates? How do you know that? What happens when the vibrations hit our ears?

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			understand how sound moves?	Seeing how the vibrations moved from one end of the Slinky to the other end helped me understand how sound moves. The push you gave the Slinky at one end bumped into each of the metal parts, and that push kept going to the other end.	Can you tell me more about what that looked like from one end of the Slinky to the other end?
2 min	**Link to Next Lesson** **Synopsis:** The teacher previews the next lesson by challenging students to think about how sound moves from a tuning fork to their ears without a Slinky.	Link science ideas to other science ideas.	**Show slide 13.** Today we used a Slinky model to help us think about how sounds move from soundmakers to our ears. It would be kind of silly if we tried to hear sounds by connecting soundmakers to our ears with a bunch of Slinkies, wouldn't it? But even without Slinkies, we know that sounds can move from soundmakers to our ears because we can hear them.		

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			Let's think about the tuning fork and the ear again. How do you think sound moves from the tuning fork to our ears without a Slinky? **Show slide 14.** Next time, we'll use a different model to help us think about how sound moves from a soundmaker to our ears.	The sound goes through the room. The sound moves from the tuning fork to our ears. Maybe the vibrations push across the room like they did with the Slinky! It goes through the air to our ears. The sound. The air is all around us. Because we can hear it.	How do you think that happens? Any other ideas? What is "it"? Where is the air? How do you know sound can move through the air?