Lesson 2.6
Explaining How Sound Energy Travels
Lesson Overview

Students focus on writing a scientific explanation to answer the Chapter 2 Question: *How does sound energy travel through water from a mother dolphin to her calf?* First, the class revisits the Sound Waves Sim to look for evidence that energy is being transferred as a result of particle collisions. Next, the class reviews the explanation they wrote in Chapter 1 about how dolphins communicate, and students consider what they will add to that explanation, now that they know more about how sound travels. The teacher helps students reflect on what they have learned and the evidence on which they will base their explanations. Students spend the remainder of the lesson writing a scientific explanation for the park superintendent, applying their understanding of how sound energy travels through materials. Students’ written explanations serve as a Critical Juncture Assessment of students’ understanding of particle collisions and energy transfer in a sound wave. This lesson allows students to demonstrate their understanding of concepts presented thus far in the unit.

**Anchor Phenomenon:** Dolphins in Blue Bay National Park communicate with one another underwater.

**Everyday Phenomenon:** Musical instruments make sound.

**Students learn:**

- When particles collide they transfer energy, and that changes how they move.
- A scientific explanation describes things that are not easy to observe, and uses scientific language.
Evidence of Energy Transfer

Project the Sound Waves Sim and have students look for evidence that energy is being transferred as particles collide.

Instructional Guide

1. Remind students of the Investigation Question and refer to the activities from the previous lesson. Remind students that they have been investigating the question *How does sound energy travel through a material?* Ask students to recall what they did in the previous lesson that helped them work on answering the question. Make sure students mention that they made models using their own bodies and used a digital tool to diagram particle collisions.

2. Review key ideas. Ask a volunteer or two to share their understanding of what happens when particles collide in sound waves. [The energy is transferred from one particle to the next; all the particles line up and then spread apart.]

   This raises another question. How do we *know* that the energy is being transferred from one particle to the next?

   We can’t see this happening, so we’ll need to use a model. The Sound Waves Sim can help us find evidence of energy being transferred because it shows particles moving in a sound wave.

3. Set purpose for investigating in the Sim. Let students know you’d like them to look for evidence that the energy is transferring from one particle to the next in a sound wave.

4. Project the Instruments mode of the Sound Waves Sim. Go to the Student Apps Page. Keep the Waveform toggle turned off. Select an instrument.

   I will play a sound, and I’d like you to observe the particles closely to look for evidence that energy is being transferred from one particle to the next.

5. Play a sound. Then, select a particle to highlight it and ask students to pay attention to it. Play the sound again with the particle highlighted and have students observe.

   Remember, you are looking for evidence that energy transfers from one particle to the next.
Play the sound (or switch to another instrument and play that sound, but be sure to highlight a particle each time) a few more times. Remind students to watch the motion of the particles closely.

6. **Have students discuss observations with a partner.** Have students turn to a partner and share the evidence of energy transfer that they observed.

7. **Reflect on the evidence of energy transfer.**

   - What evidence did you find of energy being transferred from one particle to the next?

If needed, play the sound in the projected Sim again and direct students’ attention to the motion of the particles. Accept students’ responses. [When one particle collided with the highlighted particle, both particles changed direction.]

8. **Refer to the Coin Collision Investigations.** Ask students to think about what happened as they did their Coin Collision Investigations. (If needed, you can demonstrate some coin collisions for the class to help them remember.) Ask students to recall when the nickel collided with a penny and describe what happened. [The motion energy from my hand transferred to the nickel, and that motion energy transferred to the penny, causing it to start moving.]

9. **Ask students to summarize.**

   - What can we say about what happens when particles collide?

On the board, write “When particles collide __________.” Call on students to respond by completing the sentence. [When particles collide, the energy is transferred from one particle to the next, and the way that both particles are moving changes.]

10. **Post key concept and read it aloud.**

   - When particles collide they transfer energy, and that changes how they move.

Post the key concept on the classroom wall. Point out that this key concept summarizes what students have been saying during this discussion and helps them explain how sound energy travels through a material.

**Teacher Support**

**Instructional Suggestion**

**Providing More Experience: Today’s Daily Written Reflection**

*Why are models such as the Sound Waves Simulation and our Sound Diagrams important to use as we study sound?*

This prompt (on page 42 in the Investigation Notebook) asks students to think about how the models and visual representations they have been working with are helpful for studying sound. This allows students to reflect on the activities they have been doing in class.
Instructional Suggestion

Student Thinking: Energy Transfer and Change of Motion
If students seem to be struggling with the idea that when particles collide they transfer energy, and that changes how they move, encourage them to think of times when they have seen this happen with balls. If possible, you may wish to show very brief video clips of a baseball being hit by a bat, a soccer ball being kicked, and/or a hockey puck being hit by a hockey stick—to show how the balls change direction. For each video clip, ask students to identify the point of collision and how the objects are transferring motion energy. You can help students debrief in order to ensure they are connecting what they have observed to particle collisions.

Rationale

Pedagogical Goals: Why Post the Key Concept After the Discussion?
Throughout this unit, you will notice that key concepts tend to be posted after discussions and investigations. The goal of ordering instruction in this way is to provide time for students to construct their own understanding of key ideas as much as possible before presenting the concept stated in scientific language. In this case, it’s likely that students will share ideas about energy transfer that are similar to the key concept, but students will probably not state them in the same way—they may not yet use a lot of scientific language to explain their ideas. This is fine! You can explain that the key concept is a summary of the ideas they have learned and have already figured out, phrased the way scientists would explain it. Remind them that the classroom wall is a resource they can use to remember ideas they have been learning.
Evidence of Energy Transfer

Project the Sound Waves Sim and have students look for evidence that energy is being transferred as particles collide.

Instructional Guide

1. **Remind students of the Investigation Question and refer to the activities from the previous lesson.** Remind students that they have been investigating the question *How does sound energy travel through a material?* Ask students to recall what they did in the previous lesson that helped them work on answering the question. Make sure students mention that they made models using their own bodies and used a digital tool to diagram particle collisions.

2. **Review key ideas.** Ask a volunteer or two to share their understanding of what happens when particles collide in sound waves. [The energy is transferred from one particle to the next; all the particles line up and then spread apart.]

3. **Set purpose for investigating in the Sim.** Let students know you’d like them to look for evidence that the energy is transferring from one particle to the next in a sound wave.

4. **Project the Instruments mode of the Sound Waves Sim.** Go to the [Student Apps Page](#). Keep the Waveform toggle turned off. Select an instrument.

5. **Play a sound.** Then, select a particle to highlight it and ask students to pay attention to it. Play the sound again with the particle highlighted and have students observe.

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Play the sound (or switch to another instrument and play that sound, but be sure to highlight a particle each time) a few more times. Remind students to watch the motion of the particles closely.

6. **Have students discuss observations with a partner.** Have students turn to a partner and share the evidence of energy transfer that they observed.

7. **Reflect on the evidence of energy transfer.**

   ¿Qué evidencia encontraron de que se estaba transfiriendo energía de una partícula a la siguiente?

   If needed, play the sound in the projected Sim again and direct students’ attention to the motion of the particles. Accept students’ responses. [When one particle collided with the highlighted particle, both particles changed direction.]

8. **Refer to the Coin Collision Investigations.** Ask students to think about what happened as they did their Coin Collision Investigations. (If needed, you can demonstrate some coin collisions for the class to help them remember.) Ask students to recall when the nickel collided with a penny and describe what happened. [The motion energy from my hand transferred to the nickel, and that motion energy transferred to the penny, causing it to start moving.]

9. **Ask students to summarize.**

   ¿Qué podemos decir acerca de qué sucede cuando las partículas colisionan?

   On the board, write “When particles collide ________” Call on students to respond by completing the sentence. [When particles collide, the energy is transferred from one particle to the next, and the way that both particles are moving changes.]

10. **Post key concept and read it aloud.**

    Cuando las partículas colisionan transfieren energía, y eso cambia la manera en que se mueven.

    Post the key concept on the classroom wall. Point out that this key concept summarizes what students have been saying during this discussion and helps them explain how sound energy travels through a material.

**Teacher Support**

**Instructional Suggestion**

**Providing More Experience: Today’s Daily Written Reflection**

Why are models such as the Sound Waves Simulation and our Sound Diagrams important to use as we study sound?

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