Lesson 3.6
Discussing Dolphin Communication
Lesson Overview

Students apply what they read in *The Scientist Who Cracked the Dolphin Code* to discuss their new understanding of how dolphins communicate using sound. Student pairs are assigned one of three signature whistles and are provided with a corresponding waveform. Using the waveform as a guide, pairs make and play the sound in the Sim to hear what it sounds like. Students then engage in a whole-class model during which the teacher plays the three signature whistles from the Sim and students try to recognize their whistle. After this experience, students think back to the question of how dolphins use different sounds to communicate with one another. Students reflect on and write notes about two questions to prepare for a Science Forum—a structured class discussion in which students share their ideas and explanations about how dolphins communicate using sound. The purpose of this lesson is for students to apply what they have learned about sound to understanding dolphin communication.

**Anchor Phenomenon:** Dolphins in Blue Bay National Park communicate with one another underwater and calves only respond to their mother’s call.

**Students learn:**

- Dolphin signature whistles have patterns of pitch changes, and the waveforms that represent those whistles have patterns of wavelength changes.
- Dolphins can use signature whistles to find one another when they are separated.
- Scientists discuss their ideas and explanations with one another.
Simulating Dolphin Signature Whistles

Students are assigned a signature whistle. Using a waveform for the whistle as a guide, they make the sound in the Sim.

Instructional Guide

1. **Connect to the previous lesson.** Remind students that in the previous lesson, they read *The Scientist Who Cracked the Dolphin Code*.

   - What did the scientist in the book, Laela Sayigh, learn about dolphin signature whistles?
     ([Each signature whistle has a certain pattern of pitch changes. Each bottlenose dolphin has its own signature whistle. Dolphins can recognize one another by their signature whistles.]

   - If a whistle is high-pitched, what would that tell you about the wavelength of the sound wave?
     ([The wavelength would be short.]

   - If a whistle is low-pitched, what would that tell you about the wavelength of the sound wave?
     ([The wavelength would be long.]

2. **Introduce the Dolphin Communication Model.**

   - Today, we’re going to use what you have learned about dolphin signature whistles to help us answer our Investigation Question: *How can dolphins use different sounds to communicate with one another?*

   - Marine scientists observe dolphins in the wild to learn more about them. We cannot observe dolphins in our classroom, so instead, we are going to create a classroom model of dolphins communicating.

   - In this model, you will represent the dolphin calves. You will work in pairs, and you and your partner will be assigned a signature whistle.
In the real world, each dolphin has a signature whistle. If we wanted to be more accurate, each student in this room would have his or her own whistle. But in the model we will create today, many of you will have the same whistles. In addition, the whistles you will make are simplified—real dolphin whistles are very complex.

3. Assign student pairs.

4. Project notebook. Have students turn to page 70, Dolphin Signature Whistles, in their notebooks. Point out the waveforms and explain that these represent three dolphin signature whistles. Read the directions aloud:

   • Discuss the following questions with your partner: What differences do you notice between the waveforms? What do you think each whistle sounds like?
   • When your teacher assigns you a signature whistle, circle the number to the left of the waveform. Don’t show your classmates which whistle is yours!
   • Label the amplitude and wavelength on your signature whistle.

5. Assign signature whistles as students discuss. Have pairs begin discussing the waveforms on page 70 in the Investigation Notebook. Walk around the room and quietly assign one of the three signature whistles (1, 2, or 3) to each pair. Make sure that there are approximately the same number of pairs assigned to each signature whistle. It is best if pairs do not know which whistles have been assigned to pairs near them. It is also best to scatter assignments of different signature whistles throughout the room. Students should circle the number of their signature whistle in their notebooks, without letting other students see.

6. Regain students’ attention and set purpose for using the Sound Waves Sim.

   Dolphins use their signature whistles to recognize one another when they call. Since you are playing the role of dolphin calves, you will need to be able to recognize the sound of your signature whistle.

   You know what the waveform for your signature whistle looks like. Now you will use the Sound Waves Sim to figure out what your signature whistle sounds like.

7. Explain the goals for working with the Sim.

   You will use the Custom Sound mode in the Sim. Your goal is to make your whistle in the Sim and learn what it sounds like. You should make and listen to your signature whistle in the Sim a few times so that you learn to recognize the sound. It may take you a few tries to figure out how to re-create the waveform in the Sim.

8. Distribute digital devices. Distribute one digital device to each pair of students.

9. Have students turn to page 71, Simulating Dolphin Signature Whistles, in their notebooks. Let students know that they should follow the directions on this page and write answers to the questions when they are done making their whistles.
10. **On-the-Fly Assessment:** Students make their signature whistles in the Sim and then describe them. As students make their assigned signature whistles in the Sim and complete the notebook page, circulate and notice how they describe the waveform for and the sound of their signature whistles.

11. **Collect all digital devices.** Ask students to make sure that their digital devices are turned off.

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**Embedded Formative Assessment**

**On-the-Fly Assessment 13: Describing Waveforms and Sounds**

**Look for:** As students make their assigned signature whistles in the Sim and complete the notebook page, note how they describe the waveform and the sound of their signature whistles. Do they use the word **wavelength** to explain what the waveform looks like? Do they describe how the wavelength changes, using descriptors such as **long**, **medium**, and **short**? Do they use the word **pitch** to explain what their whistles sound like? Do they accurately describe how the pitch of the sound changes from high to low, or low to high?

**Now what?** If students are not using the words **wavelength** and **pitch** to describe the waveform and the sound of their assigned signature whistles, have them think back to the ways that sounds can be different from one another. Students can review notebook pages on which they recorded information (from the Sim and from the reference book) about amplitude, wavelength, and pitch. Then, have these students discuss the differences they notice between the three signature whistle waveforms on page 70 in their notebooks. Ask them questions such as **How are these three waveforms different?** and **What would the first part of the whistle sound like, compared with the second part?** Encourage students to refer to the posted key concepts to use ideas that they have learned in the unit to describe the signature whistle waveforms and sounds.

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**Teacher Support**

**Instructional Suggestion**

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

*Think of an animal that uses sounds to communicate. Describe the animal’s sounds and what message the animal is sending.* This prompt (on page 68 in the Investigation Notebook) asks students to think about what they already know about how different animals use sound to communicate. Encouraging students to respond to this prompt can help them connect to what they read in *The Scientist Who Cracked the Dolphin Code* and *Patterns in Communication*. This can help you learn about students’ prior knowledge of how animals use sound to communicate. It also serves as an anticipatory activity for making and identifying signature dolphin whistles in the Sim.

**Background**

**Science Note: Simplified Waveforms**

The waveforms meant to represent dolphin signature whistles in this lesson are depicted as simple waves with constant amplitudes and changing wavelengths (the sounds only change in pitch). In reality, waveforms of dolphin sounds are much more complex. These waveforms have been simplified to be more accessible to fourth-grade students and to be easier to re-create in the Sim.
Possible Responses

Sound Waves Simulation: Custom Sound mode

What students should do and notice:
Student pairs are assigned one of three dolphin signature whistles and are provided with a corresponding waveform. They use the waveform as a guide to make the corresponding sound in the Sim, with the goal of being able to recognize the sound of their assigned dolphin whistle.

Investigation Notebook
Simulating Dolphin Signature Whistles (page 71)

Describe what the waveform for your signature whistle looks like.
Answers will vary.
Example response for dolphin signature whistle 2: The whistle is a pattern of short wavelengths, then longer wavelengths, then short wavelengths again.

Describe what your signature whistle sounds like.
Answers will vary.
Example response for dolphin signature whistle 2: The whistle is high-pitched, then lower-pitched, then high-pitched again.
Dolphin Signature Whistles

Below are waveforms for three dolphin signature whistles (1, 2, and 3).

1. Discuss the following questions with your partner.
   - What differences do you notice between the waveforms?
   - What do you think each whistle sounds like?

2. When your teacher assigns you a signature whistle, circle the number to the left of the waveform. Don’t show your classmates which whistle is yours!

3. Label the amplitude and wavelength on your signature whistle.

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<td>1</td>
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<td>2</td>
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<td>3</td>
<td><img src="image3.png" alt="Waveform 3" /></td>
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Simulating Dolphin Signature Whistles

1. Open the Custom Sound mode of the Sound Waves Sim.
2. Using the waveform for your whistle on page 70 as a guide, make your signature whistle in the Sim. (This might take a few tries!)
3. Make and listen to your signature whistle a few more times until you think you can recognize the sound.
4. Answer the questions below.

Describe what the waveform for your signature whistle looks like. Use words such as long, short, and wavelength.

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___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Describe what your signature whistle sounds like. Use words such as high, low, and pitch.

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Simulating Dolphin Signature Whistles

Students are assigned a signature whistle. Using a waveform for the whistle as a guide, they make the sound in the Sim.

Instructional Guide

1. Connect to the previous lesson. Remind students that in the previous lesson, they read The Scientist Who Cracked the Dolphin Code.

¿Qué aprendió la científica en el libro, Laela Sayigh, acerca de los silbidos distintivos de los delfines? [Cada silbido distintivo tiene un patrón específico de cambios de tono. Cada delfín mular tiene su propio silbido distintivo. Los delfines pueden reconocerse unos a otros por sus silbidos distintivos].

Si un silbido tiene un tono alto, ¿qué les diría eso sobre la longitud de la onda de sonido? [La longitud de onda sería corta].

Si un silbido tiene un tono bajo, ¿qué les diría eso sobre la longitud de la onda de sonido? [La longitud de onda sería larga].

2. Introduce the Dolphin Communication Model.

Hoy vamos a usar lo que han aprendido sobre los silbidos distintivos de los delfines para ayudarnos a responder nuestra Pregunta de investigación: ¿Cómo pueden usar diferentes sonidos los delfines para comunicarse unos con otros?

Los científicos marinos observan a los delfines en la vida salvaje para aprender más acerca de ellos. Nosotros no podemos observar a los delfines en nuestro salón de clases, así que, en lugar de eso, vamos a crear un modelo del salón de clases de delfines comunicándose.

En este modelo, ustedes representarán a las crías de delfín. Trabajarán en parejas, y se les asignará un silbido distintivo.
3. Assign student pairs.

4. **Project notebook.** Have students turn to page 70, Dolphin Signature Whistles, in their notebooks. Point out the waveforms and explain that these represent three dolphin signature whistles. Read the directions aloud:
   
   - Discuss the following questions with your partner: What differences do you notice between the waveforms? What do you think each whistle sounds like?
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   - Label the amplitude and wavelength on your signature whistle.

5. **Assign signature whistles as students discuss.** Have pairs begin discussing the waveforms on page 70 in the Investigation Notebook. Walk around the room and quietly assign one of the three signature whistles (1, 2, or 3) to each pair. Make sure that there are approximately the same number of pairs assigned to each signature whistle. It is best if pairs do not know which whistles have been assigned to pairs near them. It is also best to scatter assignments of different signature whistles throughout the room. Students should circle the number of their signature whistle in their notebooks, without letting other students see.

6. **Regain students’ attention and set purpose for using the Sound Waves Sim.**

7. **Explain the goals for working with the Sim.**

8. **Distribute digital devices.** Distribute one digital device to each pair of students.

9. **Have students turn to page 71, Simulating Dolphin Signature Whistles, in their notebooks.** Let students know that they should follow the directions on this page and write answers to the questions when they are done making their whistles.
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### Embedded Formative Assessment

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### Teacher Support

**Instructional Suggestion**

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Silbidos distintivos de los delfines

A continuación verás formas de onda de tres silbidos distintivos de delfines (1, 2 y 3).

1. Discute las preguntas siguientes con tu compañero/a.
   • ¿Qué diferencias notas entre las formas de onda?
   • ¿A qué se parece cada silbido?

2. Cuando tu maestro/a te asigne un silbido distintivo, encierra en un círculo el número a la izquierda de la forma de onda. ¡No les muestres a tus compañeros/as de clase cuál silbido es el tuyo!

3. Identifica la amplitud y la longitud de onda en tu silbido distintivo.
Simular los silbidos distintivos de los delfines

1. Abre la modalidad “Custom Sound” (sonido personalizado) de la simulación Ondas de sonido.
2. Usando como guía la forma de onda de tu silbido en la página 70, haz tu silbido distintivo en la simulación. ¡Tal vez necesites varios intentos!
3. Haz y escucha tu silbido distintivo unas cuantas veces más hasta que creas que puedes reconocer el sonido.
4. Responde a los ejercicios siguientes.

Describe cómo se ve la forma de onda para tu silbido distintivo. Usa palabras como larga, corta y longitud de onda.

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Describe cómo suena tu silbido distintivo. Usa palabras como agudo, grave y tono.

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