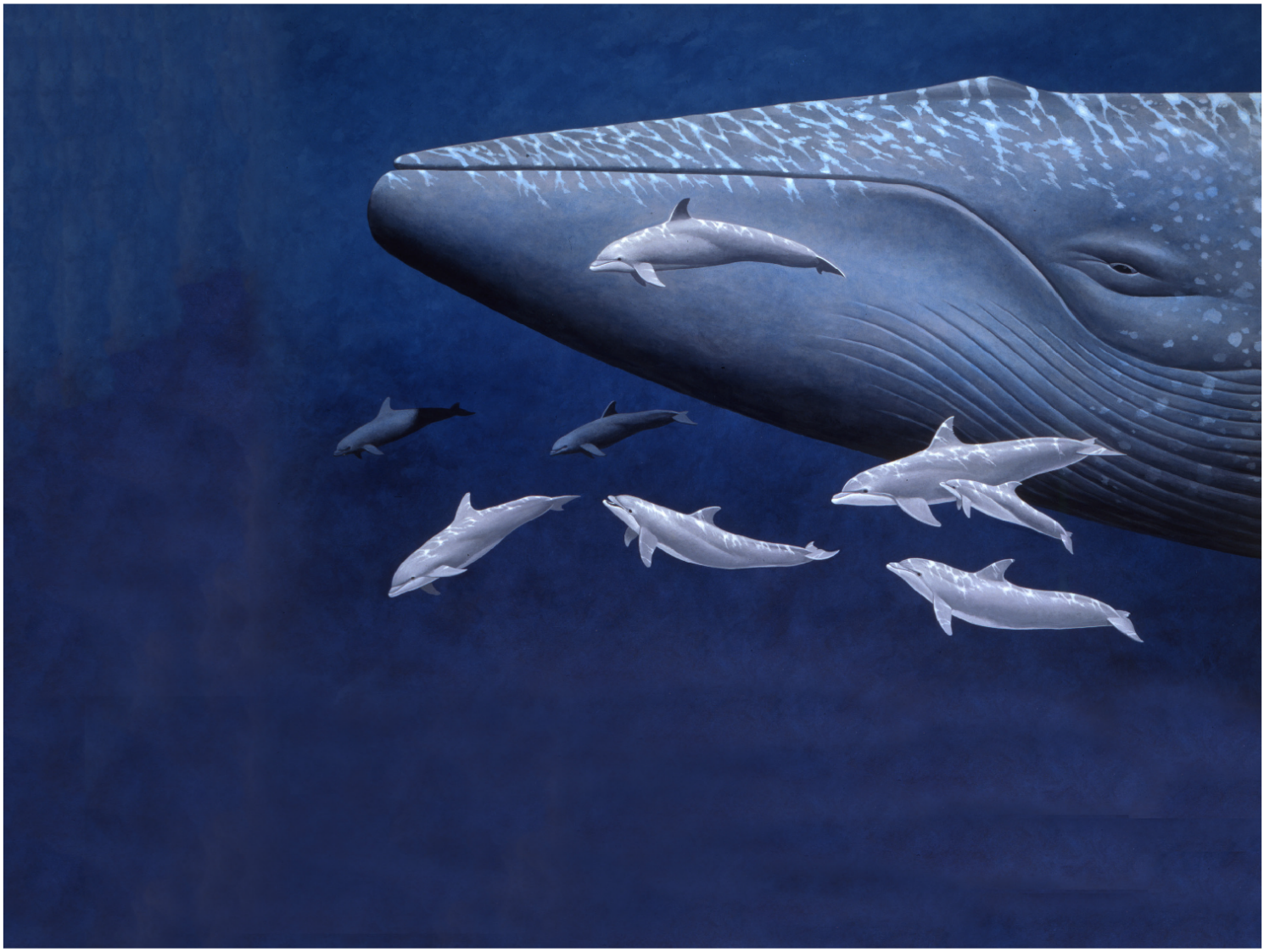
NEW BEDFORD WHALING MUSEUM

WHALES GIANTS OF THE OCEAN

Facilitator's Guide - Lesson 8.1
Sound Waves

Lesson time: 45-60 minutes



Through in-class activities, students will learn that sound is a form of energy, how to visualize a sound wave, and how sound waves travel.

www.whalingmuseum.org

INSTITUTE of Museum and Library SERVICES

NEW BEDFORD WHALING MUSEUM

WELCOME!

This facilitator's guide will assist you as you lead *Whales: Giants of the Ocean* **Sound Waves.** It includes content and links to resources,including video, that can be used to present the material to students All resources listed can be found on the New Bedford Whaling Museum education website at www.educators.whalingmuseum.org/

GUIDING QUESTIONS

How is sound created?
What types of media can sound travel through?
How do echoes work?

BY THE END OF THIS LESSON, STUDENTS WILL BE ABLE TO:

Identify the parts of a compressional wave
Explain how sound is generated and how an echo works

KEY TERMS (expanded list available in Lesson 8.1 slide deck)

Compressional Wave, Compression, Decompression, Echo, Energy, Medium Sound, Vibrate, Wave

BACKGROUND INFORMATION

Sound is a form of energy that is associated with vibrations of matter. Sound moves in wave form as a compression wave and must have a medium (air, water, solid) through which it can travel. These waves move in a given direction until they are reflected, absorbed or transmitted to another medium.

MATERIALS NEEDED

- Metal coat hanger
- 12" (30 cm) of string
- Scissors
- Slinky®
- Lesson 8.1 Slide Deck
- Student Sheet

ACADEMIC STANDARDS

NGSS| PS3.A, PS3.B, PS4.A, Cross Cutting Concepts: Energy and matter: Flows, cycles and conservation; Science and Engineering Practices: Asking questions and defining problems, Developing and using models, Analyzing and interpreting data.

COMMON CORE| **ELA** RI.4.4, RI.4.7, RL.4.7, SL.4.1, SL.4.2, W.4.1, W.4.2, W.4.3, W.4.4 | **MATH** Mathematical Practices: Reason abstractly and quantitatively, Use tools strategically, Attend to precision

LESSON DIRECTIONS

INTRODUCTION

Use slide 3 in the Lesson 8.1 slide deck to explain to students that sounds are made by vibrations and that the waves need matter, like air, water, or bones, to travel through.

As a demonstration of this, tell students to touch side of their throat and say 'aah'. What do they feel? What do they hear? Have them write their reactions and reflections on the Student Sheet.

ACTIVITY

Video instructions available

- Take two pieces of string, each long enough to reach your elbow.
- Tie each string to the two bottom corners of a coat hanger.
- Give the coat hanger - string set-up to a student.

Direct the students to do the following:

- Twist the strings a few times around each of your two index fingers.
- Swing the hanger so it taps against the side of a table and listen to the sound.
- Or, you could have a classmate tap the coat hanger with a pencil.
- Now put your index fingers (with the string attached) in your ears.
- Have a classmate tap the coat hanger with a pencil and listen.
- Tap the hanger against the table again and listen.
- Extend this activity by varying the number of times you wrap the string around your finger

WRAPPING UP

Explain to the students:

When you tap the hanger, it vibrates (moves back and forth). This makes the air around it vibrate. When these vibrations travel into your ear, you hear them as sound. If you listen to the hanger with your fingers in your ears, the vibrations travel through the string and into your ears. It sounds different because sound travels differently through string (a solid) than through air (a gas).

Have your students respond to the Think About It questions on the Student Sheet.

ACTIVITY 2

Sound waves are hard to see but we can use a Slinky® to see what a compressional wave looks like. Sound waves are formed in a way that might surprise you: when air is pushed, the particles of air are squeezed together or compressed. When the air stops being pushed, there's a 'dead space' or decompressed area behind the clump, where there is less air. If air is pushed at regular intervals, a compressional wave is formed.

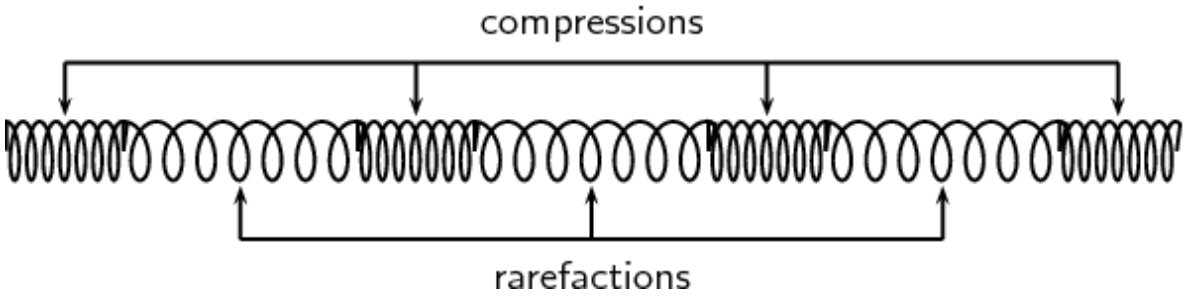
Video instructions available

Direct the students to do the following:

- Students stand at opposite sides of a table (3ft is sufficient), holding opposite ends of the Slinky.
- Have one student stretch out the Slinky halfway, and then give that end a hard push forward.
- A compression should form at that end of the Slinky and move up the coil.
- Then, if it hits the other end hard enough, the motion will ripple back down the coil to the end where the movement started.
- The student on the other end of the Slinky should try this as well.

WRAPPING UP

- Have your students respond to the two questions on the second page of the Student Sheet. The illustration shown below is included on the sheet.



Have more time?

Ask students if they have ever heard an echo.
Ask them to try to explain what is happening to the sound to make the echo.

Discuss that sound travels in a straight line until it hits an object, and then it gets reflected. Ask students to come up with analogies to share what they think an echo is like even if they can't see it.

E.g. "It's like water coming out of a hose to wash a car. Some scatters or splashes back and some is absorbed or gets the car wet. It the spray of water doesn't hit anything, it may run out of energy and fall to the ground."

Need Additional Resources?

- PBS Learning - Sound Waves

Ready for the next lesson?
Lesson 8.2
Echolocation