



Seeing With Sounds

Introduction

Orcas travel with their families in a dark undersea world. Like other dolphins, orcas use sounds to navigate, find food, communicate and stay together. Sounds travel faster and farther in water than in air. Orcas use a special adaptation called **echolocation** to "see" with sounds. Sound echoes provide orcas with information about an object's size, shape, speed, distance and direction. From nasal sacs beneath their blowholes, orca produce rapid, high-pitched sonar clicks. These sounds pass through the orca's **melon** (forehead) where they are focused into a narrow beam of sound and projected forward into the water. When these sound waves hit an object, echoes bounce back to the orca. ECHO . . . ECHO . . . ECHO. . . The orca's jawbone receives these sound waves and sends them to the orca's ear and brain. When scanning distant objects, orcas echolocate slowly. As they get closer, their sound clicks speed up.

Resident orcas of Granny's clan only eat fish and use echolocation sounds to find salmon, their favorite food. Residents are very noisy as they echolocate for salmon and talk with each other.

Transient orcas eat seals and other sea mammals. They hunt silently, sometimes turning off their echolocation clicks to sneak up on seals. Seals listen for orca sounds to figure out whether resident or transient orcas are approaching. They stay in the water when resident orcas pass by but quickly climb out onto rocks when transient orcas approach.

Key Concepts

- ◆ Orcas use sounds to navigate, find food and locate family in their dark underwater world.
- ◆ Echolocation helps an orca to "see" with sound echoes that provide information about an object's identity and location.
- ◆ Different orca clans use sounds or silence to help them hunt for fish or seals.

Activity #1-Echoes Show the Way

In this activity, students learn how to use sounds to find their way and locate objects in a dark environment.

Materials Needed: blindfolds, blank index cards, tape, clickers (like those for dog training)

Preparation: Write name cards for orca, salmon & rocks

Procedure:

1. Assign students to play different roles: ocean circle, salmon, rocks, orcas.
2. In a large open area, ask "ocean" students to form a circle to represent the ocean. The ocean boundary keeps the "orca" inside.
3. Distribute name cards to students who will play orca, salmon and rocks. Tape on chest.
4. Blindfold one orca and ask to wait outside ocean circle. Ask rocks to stand, sit or lay inside circle. Ask "salmon" to walk slowly inside circle.
5. Guide blindfolded orca into the center of the ocean circle.
6. Give orca a clicker. Orca clicks to discover what's in its path. Salmon move slowly and say "salmon" whenever the orca clicks nearby. Rocks don't move and call out "rock" whenever the orca clicks nearby.
7. Orca follows salmon by listening to the sounds of their voices. Orca tries to find salmon while avoiding rocks. When the orca tags a salmon by touching it, the salmon is caught and leaves ocean circle.
8. Add additional orcas inside circle. Switch roles and repeat role-play.

Discuss: Was it hard to find your way and locate objects without your eyesight? Why? Was it easier to catch salmon with several orcas?

Seeing With Sounds (Continued)

Activity #2 - Who's Out There?

In this activity, students learn how seals recognize the difference between **resident** orcas that eat only fish and **transient** orcas who hunt seals.

Materials Needed: black construction paper, black index cards, tape

Preparation: Cut out dorsal fins for resident and transient orcas to wear. Make seal name cards.

Procedure:

1. Line up chairs facing each other in two long rows. Chairs represent "rocks" and the area between is the "sea."
 2. Divide students into two groups – orcas and seals.
 3. Orcas and seals tape on their name cards. Orcas practice echolocation sounds (click . . . click . . . click) and calls (eek . . . eek . . . eek).
 4. Seals are given instructions to move about the sea searching for fish.
 5. Orcas are divided into 3-4 groups. The first orca group is given whispered instructions (to be transients or residents) so that seals cannot overhear.
 6. **ORCA INSTRUCTIONS :**
 - If Resident orcas: Echolocate and call out to each other. Ignore seals.
 - If Transient orca: Move quietly through the sea. Try to sneak up on an unsuspecting seal.
 - If you tag seal, seal is caught and leaves sea.
- SEAL INSTRUCTIONS:** Watch and listen to approaching orcas. Transients or residents? You can ignore noisy orcas. Quiet orcas want to hunt you. Get out of the water onto the rocks (chairs). If tagged by an orca, leave the sea.
7. Repeat role-play. Seals return to water and continue to fish. Give different instructions to the next group of orcas.

Discuss: Why do you think it's important for seals to be able to recognize the difference between resident and transient orcas? Why do they use sound as an early warning signal to recognize different orcas?

National Science Education Standards

- Science as Inquiry – Ability to Do Scientific Inquiry.
Understanding About Scientific Inquiry (K-4)
Life Science – Characteristics of Organisms. Organisms and their Environments (K-4)
National Council for Teachers of English/International Reading Association Standards:
4. Students adjust their use of spoken, written and visual language to communicate effectively with a variety of audiences and for different purposes.
 8. Students use a variety of technological and information resources to gather and synthesize information and to create and communicate knowledge.
 12. Students use spoken, written and visual language to accomplish their own purposes.

Inquiry Questions

- ◆ How does echolocation help orcas survive in a dark underwater environment?
- ◆ How do orcas "see with sounds"?
- ◆ What different ways do humans see in the dark?
- ◆ How would your life be different if you had to use sound echoes to navigate?
- ◆ Why is echolocation more effective than orca eyesight in locating fish in dark waters?
- ◆ Why do echolocation sounds cause problems for transient orcas hunting seals?