

Echolocating with Dolphins (Movement Game)

Name: _____

Date: _____

Instructions:

1. Gather your other materials to use echolocation! (Blindfold, Measuring tool (such as a tape measure, ruler, or yard stick), Timer, *Optional*: Internet access and speaker to play sounds)

2. Animals have senses (such as the use of sound, sight, smell, taste, and touch) that have adapted to the environment where they live. Discuss and answer with your classmates:

a. How do you use your senses in your daily life?

Look for students to reflect on multiple senses and to give specific examples of how they use their senses to navigate the world around them. For example, the use of sight to identify friends, to find their way around, and to read; the use of smell to identify if food is fresh or spoiled, to smell the ocean; the use of touch to know if something is too hot or too cold; the use of sound to know if a car is coming.

b. How do animals use these senses differently than humans? (*Hint: think about observations you've made of your own pets*).

Look for students to make observations about real life and to reflect on the difference in sensitivity and importance of senses between types of animals. For example, dogs rely largely on the sense of smell and are much better at smelling than humans; cats use their sense of sight well and are better at seeing in the dark; birds use their sense of hearing and make elaborate calls and songs; fish use their lateral line (a sense that humans do not have) to detect motion in the water and feel other fish in their school.

3. Read the background information below:

Animals receive information through their senses, process information in their brain, and then respond. The better an animal can sense and respond to its environment, the more likely it is to survive and reproduce.

The use of sound is a powerful sense underwater.

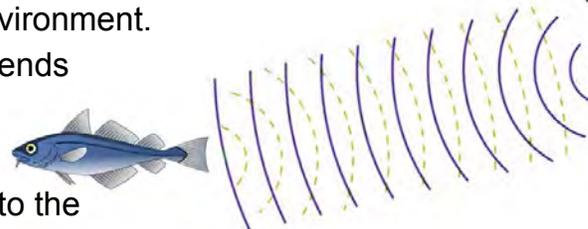
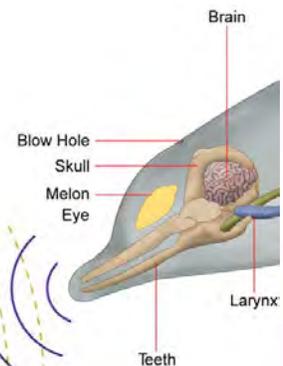
Sound actually travels faster in water than it does in air!

Toothed whales, like dolphins, use echolocation to receive sound information about their environment.

To use echolocation, a dolphin sends out a series of clicks. The sound vibrations then bounce off of an object and return, or echo, back to the

dolphin (Fig. 2). These echoes are processed in the dolphins brain to create an 'image' that gives information about the distance, shape, and characteristics of the object. This allows dolphins to 'see' further than their eyes are able.

Dolphins rely on echolocation to find prey, but they also produce and use other sounds to communicate with one another. Dolphins can make a range of sounds that differ in frequency and pitch. The sounds dolphins use to communicate are generally lower pitched whistles. Individual dolphins have their own signature whistle that is specific to them—sort of like a name!



4. *Optional:* Go to the [NOAA Fisheries Sounds in the Ocean](http://www.fisheries.noaa.gov/national/science-data/sounds-ocean#humpback-whale) page and listen to sample dolphin (or other toothed whale) sounds. Discuss what you hear with your classmates.
(<http://www.fisheries.noaa.gov/national/science-data/sounds-ocean#humpback-whale>)
5. In teams of two, choose one person to be the 'dolphin' and the other to be the 'echo.'
Note: You will switch roles, and each student will get to be both the dolphin and the echo.
- The role of the **dolphin** will be to locate, while blindfolded, the center of the target (to capture the fish) using echolocation.
 - The role of the **echo** will be to respond to the sounds of the dolphin to help guide them to capture the fish.
6. Come up with your own signature sound or whistle that is unique to you as the dolphin. Write it out here: _____
7. As a pair, come up with the different echo sounds that signal directions (left, right, forward, backward, and on target) to help find your target fish. Fill in the table below to help you remember.

Some helpful tips:

- *You will have to remember what direction your sounds represent. Choosing sounds that are similar to the direction will make it easier. For example, left could be "lah" and right could be "rah."*
- *You may want to indicate how far to move, such as "a little" or "a lot." Choose words that can be repeated ("lah lah") or extended ("laahhhhh") to indicate how far to move.*

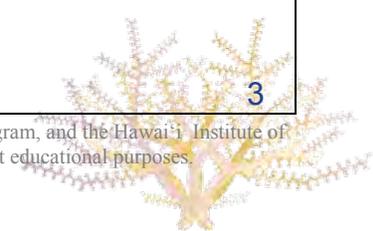
Safety note: *make sure that your environment is safe and clear of tripping hazards. As the echo you are also acting as the lookout person to help ensure dolphin is safe!*

Sound Direction	Sound Description
Left	
Right	
Forward	
Backward	
On Target!	

8. Practice making and listening to your sounds.
9. Choose an area with a large open space where it will be safe to explore while blindfolded. This will represent your ocean area!
10. Your role as the **echo**:
 - a. When the dolphin is blindfolded, place their target fish on the floor somewhere in your 'ocean area'.
Note: For a harder challenge, fold or cut the paper to reveal only the target fish.
 - b. Let the dolphin know you are ready and listen for their call.
 - c. When they make their call, respond with the appropriate echo (refer to your table) that directs them closer to the target fish.
Remember: indicate how far the dolphin should move by repeating or extending your sound.
 - d. Continue for up to one minute or until they reach the target.
 - e. When the dolphin reaches the target (or a minute), indicate that they should stop where they are and remove the blindfold.
 - f. Repeat the whole process for at least three trials. Be sure to move the target before the next trial!
11. Your role as the **dolphin**:
 - a. Read the instructions b-g before you put on the blindfold.
 - b. Make your signature sound and wait for the echo's response.
 - c. Move in the direction indicated by the echo's call.
 - d. Repeat for up to one minute (or until you reach the target).
 - e. When the echo indicates that you have reached the target (or after one minute), stop where you are and remove your blindfold.
 - f. Use the measuring tool to measure how close you were to the target fish and record the distance and your observations in your table below.
 - g. Repeat these steps for 3 trials.
 - h. Now that you know what to do, put on your blindfold and follow steps b-f above. No peeking!
12. Switch roles and repeat!



Trial	Distance to Target	Observations
Trial #1		
Trial #2		
Trial #3		





Activity Questions

1. What well for you:
 - a. as the echo (giving information)?
 - b. as the dolphin (receiving information)?
2. What were some challenges you faced:
 - a. as the echo (giving information):
 - b. as the dolphin (receiving information)
3. In order to locate the target when you were the dolphin:
 - a. What senses did you use to receive information?
 - b. How did you process the information you received from the echo?
(Hint: what happened in your mind?)
 - c. How did you respond to the information from the echo?
4. How is this activity similar to the ways that dolphins use echolocation in real life?
5. How might dolphins use sound in other ways?
6. How do you think that communication between dolphins is different than between humans?
7. What are some challenges that scientists face when studying dolphin echolocation and communication?

