



Smithsonian Latino Center

¡DESCUBRA!

Meet the Science Expert



¡DESCUBRA! CREATE-IT POCKET SCIENCE HANDOUTS

Let's have a Whale of Time!

1. Overview:

This activity offers children a wonderful opportunity to learn about sound and to think about the dangers that loudness can pose to their hearing. Groups of children will pretend to be whales looking for their groups (pods). To mimic marine mammal vocalizations, the children will shake paper cups filled with different materials to make high frequency sounds (clicks) and blow into giant straws to make low frequency sounds (whistles). The children also will wear glasses (made from cardboard following the template at the end of this activity) that will make it difficult to see at long distances.

- Age level: 8–10 years
- Time frame:
 - o Preparation: 25 minutes
 - o Activity itself: 30 minutes

2. Background:

Whales and dolphins belong to a group of marine mammals called cetaceans. They are one of the most fascinating—and most intelligent—animals in the animal kingdom. Among their more remarkable traits is their ability to produce, listen to, and process many different sounds (*vocalizations*). Their sense of hearing is extraordinarily keen. Whales and dolphins use these sounds to communicate with one another—sometimes across vast distances—which allows them to live in a complex social system. Whales and dolphins live in groups (*pods*) and communicate by making weird, wonderful sounds that sometimes can be described as clicks and whistles. Whales are even known to “sing.”



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Hearing in whales has developed to a high level because seeing under water is difficult, especially at long distances. The ocean is dark, has bits and pieces of material swirling in it, and colors are dim, which makes hearing critical for animals living in it. In order to understand how remarkable hearing is in whales and dolphins, consider this: humans have a frequency range of about 20 to 20,000 Hertz; some cetaceans have a range of 55 to 150,000 Hertz! Whales and dolphins use higher frequency sounds to navigate and find objects such as food in the ocean (*echolocation*); they use lower frequency sounds to find each other across long distances. Such extraordinary hearing comes with a price, however. Whale and dolphin ears are so sensitive that they can be easily damaged by the noise created by large freighters or military ships and sonars. And without their ability to hear, whales are in great danger. Humans, too, are having their hearing threatened by loud noise and music, especially that heard through devices such as ear buds.

3. Preparation

- **Materials for each child**

For the listening cups:

- o two 5-oz. Dixie® cups;
- o roughly 10 inches of $\frac{3}{4}$ -inch masking tape;
- o a choice of a sound making item from the following list—
 - a small piece of aluminum foil
 - a piece of crumpled paper
 - four or five staples
 - a small piece of cotton ball

For the low-frequency whistle:

- o one large jumbo tapioca straw or one bubble tea straw

For the whale glasses:

- o the template (provided at the end of this activity)
- o dispensers with $\frac{3}{4}$ -inch Scotch® Magic™ tape (frosted, not clear)
- o a pair of scissors
- o card stock for making the glasses



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- Parent prep

For making the whale glasses:

- o Assemble all materials (glasses template, scissors, Scotch® Magic™ tape)
- o For each child, copy a glass template onto an 8½x11-inch sheet of card stock and cut a set of front and leg pieces. Help each child assemble his or her glasses by taping the legs to the front; the child can then decorate his or her glasses.
- o Have enough dispensers with ¾-inch Scotch® Magic™ tape so that each child can cover the upper part of the eye openings with the clear tape. Make sure that the tape only covers the top half of the eye opening. The frosted, upper half of the glasses will mimic the difficulty in seeing at long distances under water; the bottom, clear half, mimics how whales see objects up close (see Fig. 1).



Figure 1



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For making the listening cups:

Gather all the necessary materials. Each child should have two Dixie® cups, the sound material of his or her choice (aluminum foil, paper, staples, cotton), and about 10 inches of $\frac{3}{4}$ -inch masking tape. Have the children:

- a place their choice of sound material in one of the cups and
- b join two cups together with masking tape (Fig. 2).

Depending the choice of sound materials, each child will “belong” to one of four whale pods. Try to have an equal number of children in each of the four pods.



Figure 2

For making a low-frequency whistle:

Give each child a straw. By covering the bottom of a large-diameter tapioca straw or bubble tea straw with their thumb and then blowing over the open end of the straw, much as one would blow over a soda bottle to make a tone, the children can make a low frequency sound.

The children are now ready to “become whales” and find their pods.



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4. Making and Doing:

Finding your pod

First, have all the children put on their glasses and stand close to one another. The teacher or parent should make it clear that they are no longer children, but “whales,” trying to find the members of their group—their pod—using the high-frequency sound cups. “Whales” should not talk; they should only make sounds by shaking their cups. They must listen carefully to find other “whales” that are making the same frequency sound. When all the little whales have joined their pods, you can discuss how easy or hard it was to locate the members of each pod.

Next, assemble the children into two groups, with all four “sound” pods represented in each group. Have the two groups get as far away from each other as they can; this portion of the activity may be best done outside or in a large auditorium. Have the children look around and try to find the distant whales by looking only through the top of the glasses. This exercise shows the children how difficult it is to see far away under the ocean. Have the children shake their sound cups, then listen carefully to their individual sounds and try to find their respective pods by following those unique sounds. The high frequency sounds are hard to hear and discern from long distances, so the whales will only find their nearest “family members.” Real whales experience the same thing, with high-frequency echolocation working best at short distances. Now have a group of children on one side of the room blow into their low frequency whistles. The children can clearly hear low-frequency sounds even from long distances—they know there are whales across the room, even though they may not yet know whether they belong to their pod. Have the listening group carefully walk over to the low frequency sounds. (Have the children look through the clear, bottom half of the glasses, for safety.) Once they reach the other group, all the children can again use their high-frequency cups to find their respective pods.



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Lessons learned

At the end of this exercise, the children will have a better understanding of how whales listen and why this is the only way they can communicate with each other in the ocean. They should also have a sense of how the sound pollution generated by human technology harms whales. Large freighters, military ships, and sonar all generate sound pollution in the ocean, and this noise is destroying the hearing of many marine mammals. Children also should come away with some understanding of the concept of frequency. Finally, they also should become aware that today's humans are also being harmed by sound pollution. Some of city sounds may be difficult to stop, but children do have control over some noise. For example, one of the most dangerous trends nowadays is listening to loud music on ear buds for extended periods of time. **This will cause early hearing loss!** Children can avoid this damage by not wearing such devices, or by making sure they keep the volume very low.



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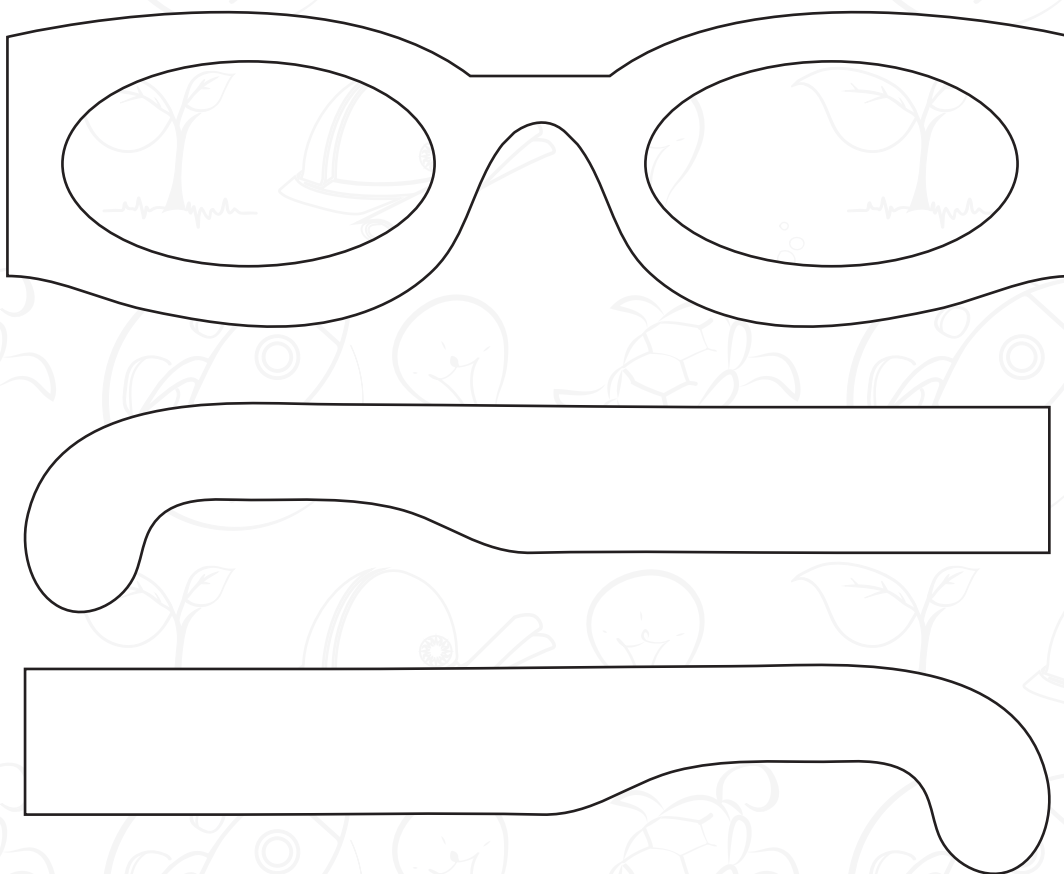
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Let's have a Whale of Time!

A Whale Listening Simulation Game



Template for making the eyeglasses



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My Notes and Observations



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