

International Snow Leopard Trust

All Ears for Adaptation: A mini-lesson in ear design

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- Goal:** For students to learn how the physical features of animals are adapted for specific purposes
- Overview:** This mini-lesson gives students a hands-on chance to experience how animals' ears have evolved to maximize sound and thus enhance survival. Students work in pairs in a simple experiment that requires no materials. This mini-lesson is a powerful and engaging way to illustrate adaptation and evolution.
- Grade Level:** 1 – 6
- Group size:** whole class activity to be carried out in pairs
- Subjects:** Biology, Science and Communication
- Time:** 15-20mins
- Materials:** none needed

Objectives:

Knowledge:

Students will: Understand that the placement and mobility of ears affect sound transmission; understand that ear development is a result of adaptation and evolution suited to particular environments.

Skills:

Students will: Be able to make general statements about different kinds of ears and the use in survival.

Values:

Students will: Understand that each organism has evolved to suit a particular environment and that maintenance of that environment is crucial to species survival.



Outline:

1. The teacher will introduce the idea of adaptation – asking students to give examples of ways organisms have adapted to suit their environment.
2. Each student selects a partner to perform the experiment with. One student stands about a foot behind the other student and cups their hands around their ears with palms forward. The student in back whispers something to the student in front. The teacher should remind students to focus on the quality of sound rather than the words being spoken.
3. The student in front is then instructed to place their hands in front of their ears with palms facing their partner. The second student then whispers the same thing in the same volume to the student in front.

4. The teacher questions the students as to what hand placement best amplifies sound (with palms back.)
5. The teacher then leads a discussion on how ear mobility can increase the range of hearing for an animal. Students should be instructed to compare their own immobile ears with those of animals whose ears are more mobile and speculate as to why these differences occur.
6. Students could then be set a homework task of finding pictures of animals whose ears can move, and try to explain why.

Instruction:

Discussion (5 minutes)

The teacher tells students they are about to do a simple experiment that illustrates adaptation. *In this experiment we will be looking at an adaptation some animals have made to their environment. Can anyone tell me what “adaptation” means? (changing in order to live in a particular environment) Can you give me some examples of an adaptation? (Long tails to help with balance; spots to help blend in with the surroundings; etc.) Why is it necessary for an animal to adapt to its environment? (Enhances ability to survive) There are many ways in which animals, humans included, adapt to their environment. The experiment we will do in just a moment illustrates how a simple adaptation can make a big difference in how an animal interacts with its environment.*

Experiment (10 minutes)

Have students select a partner and line up behind their partner with about a foot between them. Each student will have a chance to be in front.

In just a moment I want the person in back to whisper something to the person in front. The job of the person in front is to cup your hands around your ears with the palms facing forward (demonstrate.) Focus on the quality of sound rather than what is being said. Think about how well you hear the sound. Go ahead and whisper to your partner.

Now, I want the person in front to place their hands in front of their ears with the palms facing backwards towards your partner (demonstrate.) Now the person in back will repeat what they just whispered, keeping the volume the same. Again, person in front focuses on the quality of sound.

Have students change places and repeat the experiment.

Discussion of Experiment Results (10 minutes)

When your partner was behind you, what hand placement allowed you to better hear your partner? (Palms back.) Why do you think this is? (Sound is directed into the ear.) If your partner was in front, turned toward you and whispering what placement would work best? (Palms forward.) Can you think of any animals that can turn their ears toward a sound without having to turn their head? (Cats, dogs, horses, etc.) What animals can you think of who must turn their heads toward a sound because they can't turn their ears? (Humans, owls, hamsters.) Why do you think some animals can turn their ears and others can't? (Escape or hunting mechanism: snow leopards and ibex need to know where the sound is coming from in order to react appropriately. Owls depend more on sight

than on sound for finding prey, hamsters' escape mechanism is simply to bolt at any sound, regardless of where it comes from).

Closure (5 minutes)

Ear mobility is just one adaptation that certain animals have made that allows them to be more successful in their environment. By looking closely at an animal we can make some assumptions about how it interacts with its environment, and what type of environment it lives in, based on how it looks. From here on out whenever you look at an animal I would like you to think about how that animal might have evolved to suit its environment. This is an observation skill that many scientists who work with animals use all the time.

Discuss what the class has been studying, how this experiment illustrates certain aspects of those studies, and how students can use this new knowledge of adaptation to enhance further studies.

Assessment: Students should be able to define “adaptation” and give several examples of animal and human adaptations to their environments. They should also be able to use properties to describe animals’ characteristics, with an emphasis on how adaptation has influenced animal design.

Variation on Experiment

Have a small group of students stand in the middle of the room with their eyes closed (preferably blind-folded). These are the prey.

Have other students stand/sit around the edge of the class. Point to one student at a time and have them make a small noise (whisper, light tap, drop something). These are the predators.

The students in the center should try to point where the sound is coming from. First they should try to do this without cupping their hands behind their ears. Then they should try it *with* cupping their hands behind ears. Groups can take turns being prey and predator.

Discuss if it cupping hands behind ears was helpful in identifying where the sound is coming from.