

Survival of the Fittest



Objective

Students will identify their strongest and weakest sense among eyesight, touch, smell, and hearing. They will compare their results with what is known about polar bear senses.

Materials

Test: Touch (per student pair)

- two tooth picks
- one 12" ruler
- copy of "Touch Chart"
- pencil
- two 2" pieces of masking tape

Test: Vision (per class)

- three sets of 4" by 4" squares of six different colors of construction paper
- two red and blue cardboard or poster board pieces, approximately 12" by 18"
- one white cardboard or poster board piece, approximately 12" by 18"
- scissors
- tape
- room where lighting can be varied (lights on and off, shades open or closed, etc.)
- copy of "Vision Chart" for each student

Test: Hearing (per class)

- four objects to make noise with, such as blocks, stones, coins, a glass, empty can, or pen one blindfold (scarf or handkerchief)
- five sets of earplugs
- five stopwatches (or clock) that make ticking noise
- five 10' or longer tape measurers
- copy of "Hearing Chart"

Test: Smell (per class)

- six smelly items such as canned tuna, blue cheese, peanut butter, orange slices, vanilla, a flower, black licorice
- six paper lunch sacks; one for each smelly item
- copy of "Smell Chart" for each student
- pencils

Background

Eyesight: The eyesight of polar bears appears to be similar to humans. Polar bears have a protective membrane over their eyes that may help shield the eyes from ultraviolet light.

Touch: Little is known about a polar bear's sense of touch; however, polar bears have been observed delicately moving or touching objects with the nose, tongue, and claws.

Smell: A polar bear's sense of smell is acute, and it is the most important sense for detecting prey on land. A polar bear can most likely smell a seal from more than 1 km (0.06 mi.) away and 1 m (3 ft.) under the snow.

Hearing: Little is known about hearing in polar bears. However, in the air polar bears probably hear at a slightly wider range of frequencies than humans (up to 25 kHz), but not as high as a dog. Hubbs-SeaWorld Research Institute is part of a study on polar bear hearing involving polar bears from SeaWorld San Diego and the San Diego Zoo. Preliminary results indicate that polar bears

Action

1. First, conduct the following four activities to identify the students' weakest and strongest sense(s).
2. Next, after each experiment is recorded, ask your students to hypothesize about which polar bear sense they might associate with their strongest and weakest sense. If you'd like to take the experiment further, have the students present their findings and graph the class as a whole.

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Sense: Hearing

This activity will gauge how well students can listen when not allowed to see. blindfolded students will need to identify sounds coming from different directions.

ACTION Part A

1. Arrange students in a circle around the room. Select five students and distribute noise makers **WITHOUT** other students seeing noisemakers. Give one student the "Hearing Chart" sheet to record observations. Select another student, give student a blindfold and ear plugs, and ask student to sit blindfolded in the middle of the circle.
2. Have the blindfolded student place an earplug in one ear (does not matter which).
3. Instruct students with a noisemaker to make their noise when you point to them. Point to a student with a noisemaker.
4. Ask the blindfolded student to point in the direction of the sound and identify it.

Repeat this step with other students with noisemakers, each of whom will make a different sound. You may even have students with noisemakers move to different places in the circle and repeat noisemaking.

5. Ask the blindfolded student to unplug her or his ear. Repeat the process with both ears unplugged. Is she or he better able to identify the location and source of the sounds?
6. Select other students in the class and repeat the experiment.

ACTION Part B

1. Divide students into five groups and give each group a ticking stopwatch and ear plugs.
2. Each student group selects one student for the center of each student group circle. Have students place an ear plug in one ear. Have another student record distance on chart.
3. One member of the group holds the ticking stopwatch close to the center student's ear and gradually moves it away from his or her ear until he or she can no longer hear the sound. Measure and record the distance between the center student's ear and where the stopwatch was when he or she could no longer hear it. Repeat this step for the other ear.

DISCUSSION

Part A: Which sounds did the students in Part A find to be the easiest to identify? Which were hardest? Does this tell you anything about the way we hear and the sounds we expect to hear? Did the students who had already seen the noisemakers have an easier time than the student that went first?

Part B: Did students notice a significant difference between the distances their left ear could hear as opposed to their right ear? Why do you think this is?

Activity Title



Names _____

Hearing Chart

Part A

	Sound/Direction	Sound/Direction	Sound/Direction	Sound/Direction
Student 1	____/____	____/____	____/____	____/____
Student 2	____/____	____/____	____/____	____/____
Student 3	____/____	____/____	____/____	____/____
Student 4	____/____	____/____	____/____	____/____
Student 5	____/____	____/____	____/____	____/____

Part B

	left ear distance in./ft.	right ear distance in./ft.
Student 1	_____	_____
Student 2	_____	_____
Student 3	_____	_____
Student 4	_____	_____
Student 5	_____	_____



Sense: Smell

The student will identify various aromas.

Background: A polar bear's sense of smell is acute, and it is the most important sense for detecting prey on land. A polar bear can most likely smell a seal from more than 1 km (0.06 mi.) away and 1 m (3 ft.) under the snow. Stalking ringed seals at their birth lairs is a hunting method polar bears use in spring when ringed seals give birth to their pups. Ringed seal lairs are caves built under the snow drifts next to a hole in the ice. The snow drifts are on stable sea ice attached to land. Once a polar bear identifies a birth lair, it slowly and quietly positions itself next to the lair. If the polar bear smells a seal in the lair, it slowly raises up on its hind legs and crashes down with its front paws to break through the lair's roof. This method of hunting is commonly used by polar bear females with cubs under one year old.

ACTION

1. Place selected items in separate, paper lunch bags. (If any items are wet, line bag with wax paper or plastic wrap.) Introduce activity by telling students they will be identifying unknown items by smell. Distribute "Smell Chart" sheet to students.
2. Turn down the lights and walk through the classroom having each student smell and then record his or her guess for each bag.
3. Turn the lights back on and reveal each item. Have students answer questions on the bottom of the sheet. Discuss results as a class.

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Names _____

Smell Chart

Scent #1 _____

Scent #2 _____

Scent #3 _____

Scent #4 _____

Scent #5 _____

Scent #6 _____

Questions

Did you identify all of the scents correctly? _____

Some animals, such as polar bears have a keen sense of smell. How do you think your sense of smell compares to your other senses? Which would you rely the most on to locate prey?



Sense: Touch

This experiment measures students' sensitivity to touch.

Background: Some animals have whiskers, some do not. Rhinos have no need of them because they are diurnal feeders. Nocturnal animals use whiskers to feel their way in the darkness. For example, the prehensile-tailed porcupine has whiskers that are as long as their body is wide. When entering a hole or borrow, if the porcupine's whiskers touch both sides, it knows its body can't fit inside and turn around, so, it does not enter the hole.

ACTION

1. Divide students into pairs. Give each pair two toothpicks, one ruler, a copy of the "Touch Chart," and two pieces of tape. Tape one toothpick at the 1-inch mark on the ruler and the other toothpick at the 5-inch mark, with each toothpick protruding about 1/2 inch off the ruler.
2. Have one student from each pair close his or her eyes and turn with his or her back to their partner. The partner should gently, but firmly press the ruler with two toothpicks against the student's back (between the shoulder blades).
3. The student receiving the toothpick stimulus responds with a "one" or "two" verbal answer, depending on how many pricks are felt. The answer is recorded on the chart.
4. Next, the partner holding the ruler with toothpicks will move one toothpick 1/2 inch closer to the other and repeat Step 2.
5. Using 1/2 inch increments, move the toothpicks together until the partner feels that there is only one toothpick against his or her back.
6. Partners will switch roles and do this experiment again, recording all results. Have students answer the questions at the bottom of the page.
7. When complete, discuss the answers as a class.

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Names _____

Touch Chart

Position of tooth picks (inches)	Student 1 How many toothpicks did the student feel?	Student 2 How many toothpicks did the student feel?
1 inch/5 inches	1 or 2	1 or 2
1 inch/4.5 inches	1 or 2	1 or 2
1 inch/4 inches	1 or 2	1 or 2
1 inch/3.5 inches	1 or 2	1 or 2
1 inch/3 inches	1 or 2	1 or 2
1 inch/2.5 inches	1 or 2	1 or 2
1 inch/2 inches	1 or 2	1 or 2
1 inch/1.5 inches	1 or 2	1 or 2
1 inch/1 inch	1 or 2	1 or 2

Discussion

How far apart were the toothpicks when you felt one point of pressure? _____ inches

Animals with whiskers are sensitive to fine touch, as are bugs with antennae. These animals usually must see in low light conditions. How well would you do in an environment that did not have much light?



Sense: Vision

This experiment will evaluate how students view different colors as presented on different background colors and under different lighting conditions.

Background: It can easily be demonstrated that the colors we see are affected by outside factors such as the distance from which they are viewed, the background of the object we are looking at, and the lighting of the surrounding environment.

ACTION

Tape or glue one set of the six squares of construction paper on the white cardboard. Write numbers #1 through #6 under the squares. Place the second set of squares on the red cardboard, and the third set of squares on the blue cardboard. The placement and numbers assigned to the squares must be exactly the same for all cardboard panels. Distribute the "Vision Charts" to students. Students should work in groups of five or six.

Place the squares on the blue cardboard background at the front of the classroom under normal classroom lighting so all students can see. Allow students 5 minutes to fill in the first column "blue board/light room" of the "Vision Chart."

Turn off classroom lights and ask students to complete the second column "blue board/dark room."

Remove the blue cardboard panel and replace with the red panel. Turn classroom lights on. Allow students 5 minutes to complete the third column "red board/light room." Turn classroom lights off and have students fill in the fourth column.

Remove red panel. Now confirm color identities by showing the squares on the white cardboard background under normal classroom light conditions. Determine colors and confirm as a class. Write colors under the "paper colors" column on the "Vision Chart."

When complete, discussed as a group. Did all the students tested see all of the colors correctly under all of the conditions?

How do animals adapt to their own limited or unlimited vision? Based on your data from this experiment, using these colors how would you camouflage yourself at night? How would the results change if you, as an animal, were striped, spotted, etc? Were any of the students color blind, seeing completely different colors than other students?

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Names _____

Vision Chart

Paper colors	blue board/ light room	blue board/ dark room	red board/ light room	red board/ dark room
Square 1 _____				
Square 2 _____				
Square 3 _____				
Square 4 _____				
Square 5 _____				
Square 6 _____				

Questions:

Which colors were difficult to see on the blue background?

Which colors were difficult to see on the red background?

What difference did the lighting conditions make?