

17. How are dogs' senses different than humans?
18. Why do humans have two eyes and two ears?
19. What are some of the inventions that have been created to help people extend their senses or make up for the loss of senses?

Follow-up Discussion

The most important part of this segment is to examine both the facts and beliefs generated by the class in their "Everything We Know About..." list. Research indicates that students will retain their previous misconceptions — in preference to the new information — until they actively recognize and correct their own errors. Because of this, it is important to lead students to the correct ideas while identifying and correcting any misconceptions from the class list. After reviewing the list, encourage students to share the answers they got to the questions raised, before viewing the program.

Raising a thought-provoking question is a good way to assess the overall depth of student understanding. A couple of suggestions are listed below:

- How does information get from the world around us to our brains?
- Which sense is the most important? Why?
- Do you think all animals have the same senses? Why or why not?

Follow-up Activities

- Ask students to use only their sense of touch to identify mystery objects (e.g. pine cone, cotton ball, gummy bear, sand paper, cooked and uncooked pasta) by reaching into a bag where these items are placed with a gloved hand.
- Place cotton balls soaked in scent (e.g. floral perfume, lemon/vanilla/almond extract, cinnamon, pine needles) in sealed canisters so that each scent occurs in two canisters. Give each child a canister. Explain to them that they are dogs, foxes or wolves and therefore cannot talk, but must find a playmate by matching their scent to that of a playmate with the same scent.
- Ask students to describe a pattern to a blindfolded partner that they must try to replicate on paper while blindfolded.
- Have a "Senses" scavenger hunt, directing each student to look for two items that represent each of the senses.
- In groups of two, students can illustrate for each other how the iris of the eye works. Have partners face one another. Let one close his/her eyes for a count of 10 seconds and then open them. What does the partner observe? (The pupil is large, then becomes small.) Ask students to come up with an explanation of their observations.

Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.LibraryVideo.com

- www.fi.edu/qa97/me11/me11.html
These pages from the Franklin Institute Science Museum discuss the mystery of smell and contain many ideas for activities that illustrate our reliance on our senses.
- www.kidshealth.org/kid/body/mybody_SW.html
The "KidsHealth" Web site developed by the Nemours Foundation is an interactive journey through the human body.

Suggested Print Resources

- Ardley, Neil. *The Science Book of the Senses*. Harcourt Brace Jovanovich, San Diego, CA; 1992.
- Berger, Gilda & Melvin Berger. *Why Don't Haircuts Hurt?* Scholastic, New York, NY; 1999.
- Cobb, Vicki. *Your Tongue Can Tell: Discover Your Sense of Taste and Follow Your Nose; Discover Your Sense of Smell*. Millbrook Press, Brookfield, CT; 2000.
- Sims, Leslie. *Hearing*. Raintree Steck Vaughn, Austin, TX; 1995.

TEACHER'S GUIDE CONSULTANT

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All About the Senses

Grades K-4

This guide is a supplement, designed for educators to use when presenting this program in an instructional setting.

Before Viewing: Research in learning suggests that it is important for the teacher to discover what the students know — or think they know — about a topic, at the start of a new unit, so that their accurate conceptions can be validated and reinforced, and their misconceptions identified and corrected. Therefore, after reviewing the pre-viewing discussion questions provided for your class, create an "Everything We Know About..." list. Preview key vocabulary words and have students raise additional questions they hope will be answered by this program. Most importantly, students should be told that as "science detectives" they must listen closely, so that after viewing the program, they will be able to tell whether or not the facts/beliefs they put on their list were scientifically accurate.

After Viewing: After a brief discussion about the program, challenge your "science detectives" to prove or disprove the accuracy of the facts they put on their "Everything We Know About..." list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.



Program Summary

Everything we know about the world comes to us through our senses — sight, hearing, touch, smell and taste. Our senses allow us to enjoy good food, the beautiful sound of music and the warm sun on a summer day. They also help protect us from danger. Our sense organs (nose, eyes, ears, tongue and skin) are constantly taking in information and sending it to the brain for processing. Each sense organ has special parts called sensory receptors made of tiny nerve cells that collect information and send it to the brain.

The sense of touch involves three groups of sensory receptors located in the skin that covers the body. There are pressure receptors, hot and cold receptors, and pain receptors. Pain receptors alert the brain to possible danger and let the body know if it has been injured. Although pain hurts, it helps us to respond quickly to a problem before it becomes too serious. The sense of taste involves about 10,000 sensory receptors called taste buds that are located in the tongue. They are mushroom-shaped bumps that help us to identify the taste of different foods. There are four types of taste buds that sense sour, sweet, salty and bitter tastes.

Smells are detected inside the nose by special receptors that can sense chemicals in the air. These receptors send messages to the brain about every scent that enters the body, and the brain compares every smell against ones we have smelled in the past. The average human being can recognize up to 10,000 separate odors! Our sense of hearing involves sound waves traveling to our ears. Sounds move through air, water and solids, and are funneled to the opening of the outer ear. Then they travel to the eardrum, which is a thin piece of skin that separates the outer ear from the middle ear. When sounds reach the eardrum, the tiny bones in the middle ear pass the vibrations on to the inner ear. In the inner ear, approximately 25,000 receptors “wiggle” from the sound vibrations. Each wiggle communicates a different sound message to the brain. A gentle movement tells the brain that a sound is soft, while a rapid wiggle tells the brain that the sound is loud.

The sense of sight involves our eyes — the places where light enters the body. However, the actual images that we see are located in the brain itself, sent there by the receptors in the back of the eyeball. There are millions of these two special sight receptors, called rods and cones because of the way they look under a microscope. The amount of light that enters the eye through the pupil (the black hole at the center of the eye) is controlled by the colored part of the eye, called the iris. Light hits the rods and cones at the back of the eye, which send messages to the brain through the optic nerve. The brain takes these messages and assembles the whole picture in the brain. Cones help us to see things in bright light and to see colors, while rods help us to see under dim lighting conditions.

We rely on all our senses to find out about the world around us. Without sensory receptors capturing information and sending it through our nerves to our brain, we could not react to changes in our environment.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

senses — The ways in which humans are able to learn about and respond to the world around them. Our main senses are sight, hearing, touch, taste and smell.

sense organs — The eyes, ears, nose, tongue and skin, which receive messages from the outside world and send them to the brain.

nerves — Threadlike structures found throughout the body, made of special cells that are able to send and receive messages at lightning speed.

nervous system — A body system made up of the brain, the spinal cord and the nerves, which controls the entire body and keeps track of what is happening near the body at all times.

sensory receptors — Cells in each sense organ that receive information from the outside world and relay that information to the brain.

touch — The sense by which we determine the size, shape, temperature and texture of objects, using receptors in the skin. There are three groups of receptors in the skin: touch and pressure receptors, hot and cold receptors, and pain receptors.

taste — The sense that allows us to recognize the flavor of things that we eat and drink with receptors on the tongue called taste buds.

taste buds — The 10,000 sensory receptors on the tongue that tell our brain whether foods are sour, sweet, salty and/or bitter. There are four types of taste buds, each found in different areas of the tongue.

smell — The sense that allows us to recognize the odor of things in the air around us. Smell receptors are located deep inside the nose and send information to the brain about the different scents in the air.

hearing — The sense with which we translate vibrations in the world around us into sounds that we can understand. Deep in the inner ear, tiny hair-like receptors wiggle when vibrations hit them and send messages to the brain.

outer ear — The part of the ear that we can see, which works like a funnel, guiding sound waves into the ear opening to the eardrum.

eardrum — A thin piece of skin separating the outer ear from the middle ear that vibrates with every sound, moving tiny bones that send sound messages on to the inner ear.

middle ear — The area of the ear where vibrations pass through tiny bones on their way to the inner ear after sound waves hit the eardrum.

inner ear — The innermost part of the ear, where 25,000 tiny receptors wiggle with every vibration and transfer sound messages to the brain.

sight — The sense that allows us to recognize images seen when light is reflected off objects. Two types of receptors called rods and cones are located at the back of the eyeball, collecting light that enters the eyes and sending images to the brain.

iris — The colored ring of the eye that opens and closes, allowing light to enter the eye.

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pupil — The opening in the middle of the iris that lets light enter the eye.

rods and cones — The more than 100 million receptors in each eye that collect the light coming through the pupil and send messages to the brain through the optic nerve. Cones help us to see things in bright light and to see colors; rods help us to see in dim light.

optic nerve — The nerve that takes messages from the cones and rods to the brain.

sign language — A way of communicating through body movements, especially through the hands and arms.

Braille — A special alphabet for blind people made up of patterns of raised dots, representing letters of the alphabet. Braille was invented in 1829 in Paris, France, by Louis Braille.

Pre-viewing Discussion

Before students generate their list of “Everything We Know About...” this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- What are the senses, and where are they located?
- What do we use our senses for?

After the class has completed their “Everything We Think We Know About...” list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

1. Why do we need our senses?
2. What are the main sense organs?
3. How does the brain get information about the world around us?
4. How does the sense of touch get information to the brain?
5. What are the different types of touch receptors?
6. Why is it helpful to be able to feel pain?
7. How does the sense of taste work?
8. What are taste receptors called?
9. What flavors do the four different types of taste buds detect?
10. Where are the taste buds found?
11. Why is the sense of smell useful to humans?
12. How do sounds travel from the outer ear to the inner ear?
13. Why do you think it can be harmful to listen to very loud music?
14. Why do many older people need to use hearing aids and glasses?
15. How does the iris of the eye change to help us see?
16. What are rods and cones?

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