

Standard

CT – 5.2 - Perceiving and responding to information about the environment is critical to the survival of organisms.
MA – Life Science (Biology) Gr. Pre-K-2, #6; Gr. 6-8 #13

Discovering Your Senses

Connecticut

Science

Center



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CT Science Standard 5.2- Senses

Perceiving and responding to information about the environment is critical to the survival of organisms.

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Summary

This program provides you and your students with materials related to the topic of Senses. During your visit, your students will enjoy opportunities to make observations, raise questions, and learn more about the five senses in one of our Discovery Center classrooms.

In addition, your students will explore the various galleries, including the Sight and Sound Experience.

Also included in this program are lessons that provide interdisciplinary connections, as well as additional resources such as websites, literature links, career information, home and school connections, and related videos.

This program was supported by **Connecticut Health and Educational Facilities Authority (CHEFA)**. During the visit at the Connecticut Science Center students will complete activities related to specific health careers and videos of health professionals in those particular fields of interest will be shared with the students.

This program has been developed to complement some of the core themes, content standards and expected performances of the CT Core Science Frameworks, as well as the National Science Education Standards. It includes a visit to the science center which includes “hands-on” investigations that are inquiry-based and designed to engage students as well as to enhance and build upon their prior content knowledge. It may be integrated with other subjects or it may be taught in its entirety within the science classroom.

The complete CT Core Science Curriculum Frameworks is available at the website <http://www.state.ct.us/sde/curriculum/>. See also: American Association for the Advancement of Science, *Atlas of Science Literacy*, and Project 2061. In addition, Grade Level Content Standards were released in June, 2007, to “unpack” the science content for grades K-5. This program will focus on the Senses. The original science frameworks were designed to give teachers an idea of what students *should know*. Grade Level Expectations were added in July, 2008, to further “unpack” the science concepts to give an idea of what students *should be able to do*. This gives teachers an idea of what sorts of activities are appropriate to do with students, and even some ideas as to what sorts of questions can reasonably be expected to appear on the CMT.

Following are the specific sections from the CT Core Science Curriculum Framework that are addressed in this unit. The B INQ information reflects the process skills intended for grades 3-5 specifically representing the content standards of scientific inquiry, literacy, and numeracy.

Inquiry Standards

Content Standards	Expected Performances
<p>SCIENTIFIC INQUIRY</p> <ul style="list-style-type: none"> ◆ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. <p>SCIENTIFIC LITERACY</p> <ul style="list-style-type: none"> ◆ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. <p>SCIENTIFIC NUMERACY</p> <ul style="list-style-type: none"> ◆ Mathematics provides useful tools for the description, analysis and presentation of scientific data and ideas. 	<p>B INQ.1 Make observations and ask questions about objects, organisms and the environment.</p> <p>B INQ.2 Seek relevant information in books, magazines and electronic media.</p> <p>B INQ.3 Design and conduct simple investigations.</p> <p>B INQ.4 Employ simple equipment and measuring tools to gather data and extend the senses.</p> <p>B INQ.5 Use data to construct reasonable explanations.</p> <p>B INQ.6 Analyze critique and communicate investigations using words, graphs and drawings.</p> <p>B INQ.7 Read and write a variety of science-related fiction and nonfiction texts.</p> <p>B INQ.8 Search the Web and locate relevant science information.</p> <p>B INQ.9 Use measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials.</p> <p>B INQ.10 Use mathematics to analyze, interpret and present data.</p>

CT Science Standards, Grade Level Concepts & Expectations, & CMT Correlation

<i>Structure and Function -How are organisms structured to ensure efficiency and survival?</i>			
GRADE 5			
5.2 Perceiving and responding to information about the environment is critical to the survival of organisms.			
Core Science Curriculum Framework	Underlying Concepts <i>Students should understand that...</i>	Grade-Level Expectations <i>Students should be able to...</i>	CMT Expected Performances
<p>5.2.a The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system.</p>	<ol style="list-style-type: none"> 1. Animals have sense organs that are structured to gather information about their environment. Information perceived by the senses allows animals to find food, water, mates and protection. 2. Each sense organ perceives specific kinds of stimuli. Some human senses are more or less developed than the senses of other animals. 3. Sense organs transfer information through a network of nerves to the brain where it is interpreted and responded to. The brain responds by sending messages to all parts of the body. The type of response and the amount of time it takes for the response to occur vary depending on the stimulus. 4. The human ear is structured to collect sound vibrations from the environment and pass them through the middle ear (eardrum and small bones) and inner ear (hair-lined tubes) to the auditory nerve where they are transformed into electrical signals that are sent to different parts of the brain. 5. The human eye is structured to collect light through the cornea and the pupil. The amount of light that enters the eye is controlled by the iris. The cornea and the lens refract the light and focus it onto the retina and the optic nerve where it is transformed into electrical signals that are sent to different parts of the brain. 6. For anything to be visible, light must be present. For a person to see an object, the light it reflects or produces must have a straight, unobstructed path to the eye. 7. Human eyes have receptors for perceiving shades of red, orange, yellow, green, blue, indigo and violet. 8. Sunlight (or "white light") is a combination of colors. White light passed through prisms, water droplets or diffraction gratings can be refracted to show its component colors: red, orange, yellow, green, blue, indigo and violet. 9. The perceived color of an object depends on the 	<ol style="list-style-type: none"> 1. Explain the role of sensory organs in perceiving stimuli (e.g., light/dark, heat/cold, flavors, pain, etc.) 2. Pose testable questions and design experiments to determine factors that affect human reaction time. 3. Conduct simple tests to explore the capabilities of the human senses. 4. Summarize nonfiction text to explain the role of the brain and spinal cord in responding to information received from the sense organs. 5. Identify the major structures of the human eye, ear, nose, skin and tongue, and explain their functions. 6. Draw diagrams showing the straight path of light rays from a source to a reflecting object to the eye, allowing objects to be seen. 7. Describe the properties of different materials 	<p>B20. Describe how light absorption and reflection allow one to see the shapes and colors of objects.</p> <p>B21. Describe the structure and function of the human senses and the signals they perceive.</p>

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	<p>color of the light illuminating it and the way the light interacts with the object. The color humans see is the color that is reflected by the object. For example, an object that appears green is absorbing all colors except green, which is reflected to the eye.</p> <p>10. Human skin is structured to detect information related to texture, temperature, pressure and vibration. Each sensation has different receptors distributed around the body; some areas of the body have greater concentrations of receptors for certain sensations, making those areas more sensitive than others to texture, temperature, or pressure.</p> <p>11. Human noses are structured to collect and detect chemicals floating in the air (odors). Tiny hairs behind the nose have special receptors that respond to airborne chemicals and produce electrical signals that are transmitted to different parts of the brain by the olfactory nerve.</p> <p>12. Human tongues are sense organs that are structured for detecting chemicals dissolved in saliva (flavors). Taste buds respond to 4 basic tastes: salty, sweet, sour and bitter. Special receptors in taste buds respond to tastes and produce electrical signals that transmit information through nerves to different parts of the brain.</p> <p>SCIENTIFIC LITERACY TERMINOLOGY: sense organ, receptor, stimulus, response, nervous system, vibration, reflect, refract, cornea, pupil, iris, lens, retina, white light, absorb</p>	<p>and the structures in the human eye enable humans to perceive color.</p>	
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Massachusetts Learning Standards

Life Science (Biology)

Grades PreK-2

6. Recognize that people and other animals interact with the environment through their senses of sight, hearing, touch, smell, and taste.

Grades 6-8

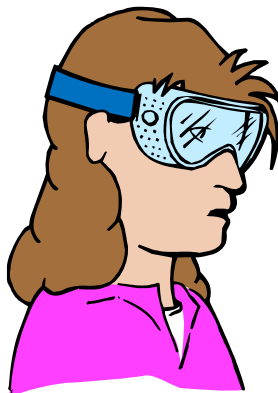
1. Give examples of ways in which organisms interact and have different functions within an ecosystem that enable the ecosystem to survive.

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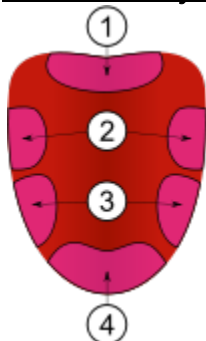
Safety Standards

- Review expectations for appropriate behavior, handling of materials, and cooperative group procedures to be sure those activities are accessible and safe for all students prior to beginning these investigations.
- Make any necessary student modifications.
- Monitor students to be sure they are acting appropriately, handling materials accordingly, and working cooperatively especially when working with the glass bottles and striking objects to make sounds
- For more comprehensive information on science safety, consult the following guidelines from the Council of State Science Supervisors; Connecticut Department of Education
http://www.csss-science.org/downloads/scisaf_cal.pdf



Misconceptions and Facts about the Senses

Human body and Health misconceptions



An incorrect map of the tongue showing zones which taste bitter (1), sour (2), salty (3) and sweet (4). In reality, all zones can sense all tastes.

- Different tastes can be detected on all parts of the tongue by taste buds, with slightly increased sensitivities in different locations depending on the person, contrary to the popular belief that specific tastes only correspond to specific mapped sites on the tongue. The original tongue map was based on a mistranslation by a Harvard psychologist of a discredited German paper that was written in 1901.
- People do not use only ten percent of their brains. While it is true that a small minority of neurons in the brain are actively firing at any one time, the inactive neurons are important too. This myth has been commonplace in American culture at least as far back as the start of the 20th century, and was attributed to William James, who apparently used the expression metaphorically. Some findings of brain science (such as the high ratio of glial cells to neurons) have been mistakenly read as providing support for the myth.
- There is no single theory that satisfactorily explains myopia—in particular, studies show that so-called eyestrain from close reading and computer games can lead to myopia, but the underlying physiologic mechanism is poorly understood. There is also no evidence that reading in dim light or sitting close to a television causes vision to deteriorate.

General Misconceptions about Sound and Hearing

- Loud sound is not dangerous, as long as you don't feel any pain in your ears.

Not true: Our threshold for pain is at about 120 - 140 dB SPL but sound begins to damage our hearing when it is above 85 dB SPL (for an 8 hour period).

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- Hearing loss after sound exposure is temporary.

Not true: Some of the hearing loss will be permanent. Indication of damage is ringing and noise in the ears (called tinnitus) after sound exposure. This is a clear indication that sound exposure took place. Another indication of that is the difficulty to communicate on the phone and in the noisy restaurant or cafeteria.

- If you have a hearing loss already, you don't have to protect your hearing any more.

Not true: Hearing loss accumulates. More exposure to loud sounds leads to more hearing loss.

- Hearing loss is mostly caused by aging.

Not true: Research shows that accumulative exposure to loud sounds, not age, is the major cause of hearing loss.

- Hearing loss can be repaired by medicine, surgery or hearing aids.

Not true: Although certain improvements can be obtained by the use of hearing aids. In the case of hearing losses inflicted due to the noise exposure, the resulting quality of hearing will be far from normal. So far no drugs or therapy can correct noise induced hearing loss. This could affect your professional performance as a musician, sound engineer, medical doctor, air traffic controller, telephone operator, pilot and driver or in any other profession where performance depends on good hearing. Also, your enjoyment of music would suffer.

- Loud sound only damages your hearing.

Not true: Loud sound can change your heart rate, vision and reaction time. It may make you more aggressive and in general, negatively affect you.

Common Misconceptions about Sight Loss

There are many misconceptions about vision loss and blindness among the general public. Here are some of them:

1. All blind people are totally blind.

There is a wide spectrum of sight loss among people who are legally blind, ranging from slight impairment of vision all the way to total blindness. Only about 10 percent of legally blind people are totally blind. The majority of people who are blind have some degree of vision remaining.

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2. Legal blindness means total blindness.

Legal blindness is a term used by the IRS and other agencies to determine whether a person is eligible for disability benefits or other services. Legal blindness does not necessarily mean total blindness. You are considered legally blind if the central vision in your better eye, with the best correction possible, is no better than 20/200 (20/20 being normal); or if your peripheral vision is no greater than 20 degrees diameter in your better eye.

3. All blind people can read Braille.

Only about 10 percent of people who are blind or visually impaired can read and write Braille.

Source of list of misconceptions: <http://amasci.com/miscon/miscon.html>
in conjunction with Operation Physics American Institute of Physics 1825 Connecticut Ave. NW, Suite 213 Washington, DC 20009 (202) 232-6688 <http://www.aip.org>

Additional research about misconceptions was found at:
<http://www.project2061.org/publications/bsl/online/ch15/findings.htm#Ch5>

CT Science Center Classroom Visit Activity

Discovering Your Senses Enrichment Program (90 min program)

*Meets Connecticut Science Standard **5.2**

Structure and Function- Perceiving and responding to information about the environment is critical to the survival of organisms

*Fits core science curriculum framework **5.2a** –The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system

*Meets **GLE- 3**. Conduct simple tests to explore the capabilities of the human senses

This lesson is in 3 parts covering the 3 of the 5 senses.

Intro: (5 minutes)

Why do we need the five senses? If you had to lose a sense which one would you choose? Students will be asked to record their responses and then will be asked to think about those answers as we explore the senses. We will complete 3 activities related to the sense of hearing, sight, and smell. During their investigations students will be asked to write down in their science notebooks what they are noticing and wondering as they move through the activities. When they complete all activities at the end of the class we will see if their answers to those initial questions changed or stayed the same.

1. **Hearing (20 min)**- Do you hear what I hear? Students will investigate different types of sound waves. We will use the Vernier Labpro and microphone . Using that equipment we will complete graphs showing the patterns our voices create. Students will work in groups of 2 on one computer. First, one student will talk into the microphone; then their partner will take a turn. What do you notice? What does your own voice look like? Students will compare the sound waves created by their own voices. Secondly, students will take turns striking individual tuning forks in a set of 8 (all of varying frequencies). What do you notice? Discuss the differences in the pitch. Thirdly, students will play a song on the Pandora website. With a set of earphones hooked into the computer, they will place the microphone next to the earpiece of one of the earphones. What do

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you notice about different types of songs? What do the waves look like from various musical instruments? Show the instruments on the Starboard and look at the readings on the Vernier.

During our activities we are hearing different pitches and seeing them represented graphically on the screen. A possible wondering in the classroom could be: Are there people who cannot hear different pitches? As you get older you lose the ability to hear high pitches. It is called presbycusis, or aging ear. We will show the representation of the those ages and show a video related to hearing.

Video:

http://www.nytimes.com/2006/06/12/technology/12ring.html?_r=1 This website gives information on the cell phone ring that only young people can hear.

Teacher notes:

The cell phone ring tone is an offshoot of an invention called the Mosquito, developed last year by a Welsh security company to annoy teenagers and gratify adults, not the other way around.

It was marketed as an ultrasonic teenager repellent, an ear-splitting 17-kilohertz buzzer designed to help shopkeepers disperse young people loitering in front of their stores while leaving adults unaffected.

The principle behind it is a biological reality that hearing experts refer to as presbycusis, or aging ear. While Miss Musorofiti is not likely to have it, most adults over 40 or 50 seem to have some symptoms, scientists say.

While most human communication takes place in a frequency range between 200 and 8,000 hertz (a hertz being the scientific unit of frequency equal to one cycle per second), most adults' ability to hear frequencies higher than that begins to deteriorate in early middle age.

"It's the most common sensory abnormality in the world," said Dr. Rick A. Friedman, an ear surgeon and research scientist at the House Ear Institute in Los Angeles.

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But in a bit of techno-jujitsu, someone — a person unknown at this time, but probably not someone with presbycusis — realized that the Mosquito, which uses this common adult abnormality to adults' advantage, could be turned against them.

The Mosquito noise was reinvented as a ring tone.

"Our high-frequency buzzer was copied. It is not exactly what we developed, but it's a pretty good imitation," said Simon Morris, marketing director for Compound Security, the company behind the Mosquito. "You've got to give the kids credit for ingenuity."

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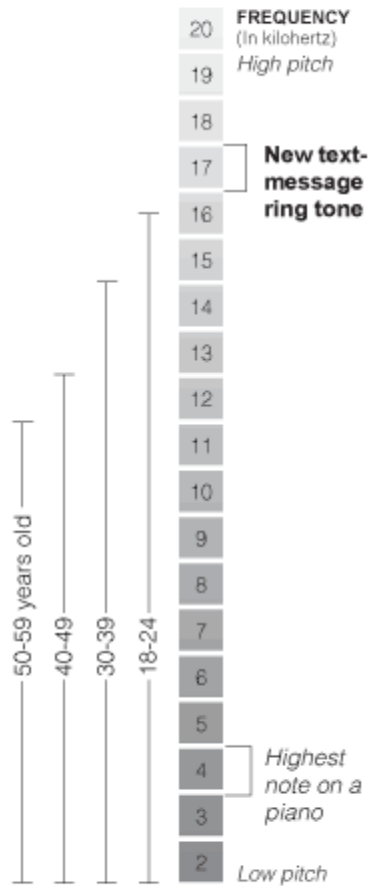
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Hearing High Tones

New York area teenagers have begun using a text-message ring tone with a frequency too high for most adults to hear.

Range by age group

Audible frequencies for sound at 60 decibels SPL (sound pressure level)



Sources: "Extended High-frequency Audiometry" by Petter Halmo, Arne Sundby and Iain WS Mair; Andy Vermiglio, House Ear Institute; Compound Security Systems

The New York Times

If you have problems with hearing you may be sent by an audiologist for a hearing test.

Video of hearing test (1:37) Audiologists are trained to diagnose, manage and/or treat hearing or balance problems. An audiology technician would help perform a hearing test.

<http://www.careflash.com/video/hearing-test?lc=en>

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Teacher notes:

Hearing Tests

A hearing (audiometric) test is part of an ear examination that evaluates a person's ability to hear by measuring the ability of sound to reach the brain.

The sounds we hear start as vibrations of air, fluid, and solid materials in our environment. The vibrations produce sound waves, which vibrate at a certain speed (frequency) and have a certain height (amplitude). The vibration speed of a sound wave determines how high or low a sound is (pitch). The height of the sound wave determines how loud the sound is (volume).

Hearing happens when these sound waves travel through the ear and are turned into nerve impulses. These nerve impulses are sent to the brain, which "hears" them.

- Sound waves enter the ear through the ear canal (external ear) and strike the eardrum (tympanic membrane), which separates the ear canal and the middle ear.
- The eardrum vibrates, and the vibrations move to the bones of the middle ear. In response, the bones of the middle ear vibrate, magnifying the sound and sending it to the inner ear.
- The fluid-filled, curved space of the inner ear, sometimes called the labyrinth, contains the main sensory organ of hearing, the cochlea. Sound vibrations cause the fluid in the inner ear to move, which bends tiny hair cells (cilia) in the cochlea. The movement of the hair cells creates nerve impulses, which travel along the cochlear (auditory, or eighth cranial) nerve to the brain and are interpreted as sound.

Hearing tests help determine what kind of hearing loss you have by measuring your ability to hear sounds that reach the inner ear through the ear canal (air-conducted sounds) and sounds transmitted through the skull (bone-conducted sounds).

Most hearing tests ask you to respond to a series of tones or words, but there are some hearing tests that do not require a response.

A hearing test is part of an ear examination that evaluates a person's ability to hear.

Hearing test results	
Normal	You are able to hear whispered speech accurately. You can hear tones at equal loudness in both ears. You are able to repeat 90% to 95% of the words in a word recognition test. The microphone detects emissions from the inner ear in

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	otoacoustic emissions (OAE) testing. The values recorded on the graph for auditory brain stem response (ABR) testing show that the nerves in the brain responsible for hearing are working normally.
Abnormal	You are not able to hear the whispers during a whispered speech test, or you are able to hear with one ear but not with the other. You hear the tone more loudly in one ear than in the other. You can only hear certain sounds at high decibel levels. You can hear sounds but you cannot understand words. No emissions are detected from the inner ear in otoacoustic emissions (OAE) testing. The values recorded on the graph for auditory brain stem response (ABR) testing show that nerves in the brain responsible for hearing are not functioning normally.

2. Sight- (25 minutes)

Students will experience Optical Illusions. We will have optical illusions and 3D illusions on the computers for students to view. What do you notice about these different pictures? What are you wondering? We will explore how our eyes and brain help us view the world and how sometimes we can be tricked by our own eyes.

<http://www.colorcube.com/illusions/illusion.htm>

<http://visualfunhouse.com/> (various 3D optical illusions including chalk drawings, include Flaming Streets http://visualfunhouse.com/chalk_drawings/flaming-streets-of-chalk.html)

Video of the best optical illusions: (3 minutes)

http://www.metacafe.com/watch/1677404/the_best_optical_illusions/

One wondering that may be mentioned in class is as follows:

Can everyone see in 3D?

Stereoblindness (also stereo blindness) is the inability to see in 3D using stereo vision, resulting in inability to perceive stereoscopic depth by combining and comparing images from the two eyes. (There are other ways to perceive depth to partially compensate, such as movement parallax and image cues such as shadows and geometric overlap.)

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Individuals with only one eye always have this condition; the condition also results when two eyes do not work in proper concert.

It has been asserted that the Dutch painter Rembrandt may have been stereoblind, which would have aided him in flattening what he saw for the production of 2D works.

In comparison to those with stereoblindness, people with normal stereo vision are described as *stereo-acute*.

Video (3min) If you have issues with your vision you can attend vision therapy sessions to try to improve your vision. Vision therapy -- a type of physical therapy for the eyes and brain -- is a highly effective non-surgical treatment for many common visual problems such as lazy eye, crossed eyes, double vision, convergence insufficiency and some reading and learning disabilities.

Optometrist discussing vision therapy (3 min)

<http://www.brighteyesnews.com/category/vision-therapy/>

Teacher's notes:

In 2006, noted neurologist Oliver Sacks published a case study about "Stereo Sue", a woman who had regained her stereo vision, absent for 48 years, after undergoing vision therapy. The article was published in *The New Yorker* magazine, which is fact-checked but not peer-reviewed, very few details were given of the exact therapies used and the article discussed only one case of stereo rehabilitation. However, the woman described by Sacks, Susan Barry, a neurobiology professor at Mt. Holyoke College, subsequently published a book, "Fixing My Gaze." The book discusses multiple case histories and details the therapy procedures and the science underlying them.

3. Smell (30 minutes) - We will have students explore different types of scents. There are many scents all around us in our environment. They will experience two different types present in sealed containers and try to differentiate between them. (lavender versus lemon)

Mystery Scents- What is that smell? We will explore how our environment influences our reactions and feelings. Can certain scents relax us? We will measure our brain waves and compare them without being exposed to a certain scent (control) and with exposure to a particular scent.

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Mindset Activity- Students will be introduced to the Mindset. The Mindset is new technology that helps us measure our brain waves and use them to do activities. <http://www.neurosky.com/mindset/mindset.html>

Each group will take a turn using the Mindset to look at their brain waves. They will observe their brain waves as they smell a particular scent. Do you notice any differences?

What would happen if you lost your sense of smell?

Teacher notes:

If you lost your sense of smell, called anosmia, you would want to visit a ENT (Ear, Nose and Throat physician) who would give you some tests to see why you could not smell. The ENT may want to do tests to see if your sinuses are blocked. One such test could be a CT scan.

Computerized tomography (CT) scan. Computerized tomography is a type of X-ray imaging that enables your doctor to locate nasal polyps and other abnormalities associated with chronic inflammation. It's also important in helping your doctor rule out the presence of other possible obstructions in the nasal cavity, such as a cancerous growth.

Video of CT: (under a minute)

<http://www.mayoclinic.com/health/ct-scan/MM00088>

Additional teacher notes:

The sense of taste is related to the sense of smell. Additional questions may arise in your classroom after the students have worked with the activity related to the sense of smell. Additional information regarding the sense of taste follows:

Many of us take our sense of taste for granted, but a taste disorder can have a negative effect on a person's health and quality of life. If you are having a problem with your sense of taste, you are not alone. More than 200,000 people visit a doctor each year for problems with their chemical senses, which include taste and smell.

The senses of taste and smell are very closely related. Some people who go to the doctor because they think they have lost their sense of taste are surprised to learn that they have a smell disorder instead.

How does our sense of taste work?

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Our ability to taste occurs when tiny molecules released by chewing, drinking, or digesting our food stimulates special sensory cells in the mouth and throat. These taste cells, or gustatory cells, are clustered within the taste buds of the tongue and roof of the mouth, and along the lining of the throat. Many of the small bumps on the tip of your tongue contain taste buds. At birth, we have about 10,000 taste buds, but after age 50, we may start to lose them.

When the taste cells are stimulated, they send messages through three specialized taste nerves to the brain, where specific tastes are identified. Each taste cell expresses a receptor, which responds to one of at least five basic taste qualities: sweet, sour, bitter, salty, and umami. Umami, or savory, is the taste we get from glutamate, which is found in chicken broth, meat extracts, and some cheeses. A common misconception is that taste cells that respond to different tastes are found in separate regions of the tongue. In humans, the different types of taste cells are scattered throughout the tongue.

Taste quality is just one aspect of how we experience a certain food. Another chemosensory mechanism, called the common chemical sense, involves thousands of nerve endings, especially on the moist surfaces of the eyes, nose, mouth, and throat. These nerve endings give rise to sensations such as the coolness of mint and the burning or irritation of chili peppers. Other specialized nerves give rise to the sensations of heat, cold, and texture. When we eat, the sensations from the five taste qualities, together with the sensations from the common chemical sense and the sensations of heat, cold, and texture, combine with a food's aroma to produce a perception of flavor. It is flavor that lets us know whether we are eating a pear or an apple.

Many people who think they have a taste disorder actually have a problem with smell. When we chew, aromas are released that activate our sense of smell by way of a special channel that connects the roof of the throat to the nose. If this channel is blocked, such as when our noses are stuffed up by a cold or flu, odors cannot reach sensory cells in the nose that are stimulated by smells. As a result, much of our enjoyment of flavor is lost. Without smell, foods tend to taste bland and have no flavor.

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What are the taste disorders?

The most common taste disorder is phantom taste perception; that is, a lingering, often unpleasant taste even though you have nothing in your mouth. We also can experience a reduced ability to taste sweet, sour, bitter, salty, and umami, a condition called hypogeusia. Some people cannot detect any tastes, which is called ageusia. True taste loss, however, is rare. Most often, people are experiencing a loss of smell instead of a loss of taste.

Both taste and smell disorders are diagnosed by an otolaryngologist, a doctor of the ear, nose, throat, head, and neck. An otolaryngologist can determine the extent of your taste disorder by measuring the lowest concentration of a taste quality that you can detect or recognize. You may also be asked to compare the tastes of different substances or to note how the intensity of a taste grows when a substance's concentration is increased.

Scientists have developed taste testing in which the patient responds to different chemical concentrations. This may involve a simple "sip, spit, and rinse" test, or chemicals may be applied directly to specific areas of the tongue.

An accurate assessment of your taste loss will include, among other things, a physical examination of your ears, nose, and throat; a dental examination and assessment of oral hygiene; a review of your health history; and a taste test supervised by a health care professional.

DNA Map Shows Pandas May Lack Meat Taste Buds

Genome mapping showing that pandas may prefer a bamboo-based diet because they can't taste meat could unlock secrets to ensuring the survival of the endangered species.



In this photo supplied by Adelaide Zoo, Australia's Governor General Quentin Bryce observes male... ▼
(AP)

CT Science Standard 5.2- Senses

Perceiving and responding to information about the environment is critical to the survival of organisms.

The findings published in "Nature" magazine come from a study led by the Beijing Genomics Institute's branch in Shenzhen in southern China.

The study found that pandas likely roamed the Earth as far back as 3 million years ago, with a genetic makeup that evolves slower than that of humans and other mammals.

"We hope the information gathered from mapping ... our 3-year-old female panda will aid in their conservation efforts," study co-author Wang Jun said Monday from Shenzhen.

Mutations in certain sequences of the giant panda's taste gene, which can affect the ability to experience savory flavors such as meat and other high-protein foods, may have turned them onto a strict bamboo diet, the study said.

Further findings from the panda, named after the Beijing Olympics mascot "Jingjing," suggested the decline in the giant panda population was not caused by inbreeding, because her DNA in various cells differed in many places.

Jingjing's genome map showed that pandas have a similar genetic makeup to dogs and are a subspecies of Ursidae, the bear family, confirming results found in studies from late last year and earlier this year.

A **geneticist** is a scientist who studies genetics, the science of heredity and variation of organisms. A geneticist can be employed as a researcher or lecturer. Some geneticists perform experiments and analyze data to interpret the inheritance of traits.

Geneticists participate in courses from many areas, such as biology, chemistry, physics, microbiology, cell biology, English, and mathematics. They also participate in more specific genetics courses such as molecular genetics, transmission genetics, population genetics, quantitative genetics, ecological genetics, and genomics.

Geneticists can work in many different fields, doing a variety of jobs. There are many careers for **geneticists in medicine**, agriculture, wildlife, general sciences or many other fields.

Video Genetic test for hearing loss: (1:35)

<http://www.5min.com/Video/Genetic-Test-For-Kids-Hearing-Loss-175529180>

CT Science Standard 5.2- Senses

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Wrap-Up (10 min)

At the end of the class we will review all the senses we worked with during class and emphasize the many different health careers that can be associated with each one. Students will also be shown a chart that includes an extensive list of all related health careers not just the ones showcased during the class experience.

We will review the classes initial responses to the questions posed at the beginning of class and see if those answers changed or may have remained the same.

CT Science Standard 5.2- Senses

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Correlation with Gallery Programs

There are gallery programs available that complement this lesson.

The gallery programs focus on CT 5.2 GLES 1 and 5.

1. Explain the role of sensory organs in perceiving stimuli (light/dark, heat/cold, flavors, pain, etc) in sending signals to the brain. The gallery program is related to sensory perception- how the body feels different types of sensation including pain. The RescuiAnne medical simulator is used to show different injuries and how a patient feels sensations.

5. Identify the major structures of the human eye, ear, nose, skin and tongue, and explain their functions. The gallery program explores these through dissections.

OWC Teacher Trail Guide

Putting Science to Work in Connecticut

Go to the **Picture of Health Gallery** on the 5th floor
Find the Putting Science to Work in Connecticut video kiosk

View the two videos filmed at the following locations in the State of Connecticut:

Mount Sinai Rehabilitation Hospital, a SAINT FRANCIS *Care* Provider

What is a Lokomat? What is it used for and how could it help a patient?

What health career is included in this video?

There are many people that live and work in our State of Connecticut that contribute to keeping us healthy in our communities.

Have you ever thought about pursuing a health related career in the future?

Sponsored by State of Connecticut Office for Workforce Competitiveness

Teachers Notes:

A Lokomat is advanced robotic therapy equipment that is able to train stroke damaged brains to regain control over their bodies . It allows people to recover and improve their lives. Patients basically relearn how to walk. Not only stroke victims but patients with spinal cord injuries and MS patients are now using this technology. Physical therapist.

CT Science Standard 5.2- Senses

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Putting Science to Work in Connecticut

Go to the **Picture of Health Gallery** on the 5th floor
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View the two videos filmed at the following locations in the State of Connecticut:

Ahlstrom Nonwovens LLC

What is a Nonwoven composite? Why is it important to maintaining good health?

What health careers are included in these videos?

There are many people that live and work in our State of Connecticut that contribute to keeping us healthy in our communities.

Have you ever thought about pursuing a health related career in the future?

Sponsored by State of Connecticut Office for Workforce Competitiveness

Teacher Notes: A nonwoven composite is a web of material- synthetic material is compressed into a sheet. It is a breathable viral barrier. Specialized plastics are used to create the non-woven, multi-layered materials which allow air and moisture to pass through, but block the passage of bacteria and even viruses. These materials are used in hospitals to protect both the patients and medical staff from potentially deadly contamination. Product Development Scientist

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OWC Student Trail Guide

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Teacher Resources

Safety Disclaimer:

The content of this Teacher's Resource section is intended to serve as an educational resource for teachers and students.

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Background for the Teacher

What are the senses?

Senses are the physiological capacities within organisms that provide inputs for perception. The senses and their operation, classification, and theory are overlapping topics studied by a variety of fields, most notably neuroscience, cognitive psychology (or cognitive science), and philosophy of perception. The nervous system has a specific sensory system or organ, dedicated to each sense.



CT Science Standard 5.2- Senses

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Professional Development

Field Trip Professional Development Workshop

Come be a student for a day! Prior to bringing your class to the CT Science Center, you are encouraged to spend time at the Center and explore the exhibits and programs available to you and your students by participating in our two day Field Trip Professional Development Workshop.



During these two days, you will have an opportunity to explore the Sight and Sound Gallery, the Health and Sports Gallery, and other relevant galleries using our standards based Trail Guides. These guides will lead you and your students on the pathway toward enjoying the museum while maintaining focus on your grade level or content standard.

CT Science Standard 5.2- Senses

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Interdisciplinary Extensions: Senses

Language Arts

Sensory Poems-

http://kiwiyert.tripod.com/sensory_poems.htm

Art

Art lessons for all grade levels-

http://www.princetonol.com/groups/iad/lessons/categorized_lessons.html

Technology

New technology that measures brain waves-

<http://www.neurosky.com/mindset/mindset.html>

CT Science Standard 5.2- Senses

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Teacher Websites

Lessons and activities for Kindergarten:

gopher://eric.syr.edu:70/11/Lesson

Lessons and activities for Second grade:

<http://www.minnetonka.k12.mn.us/support/science/lessons23.html>

All About Me: My Five Senses First/Second Grade Mini-Unit By Michelle Curtiss:

http://www.ed.uiuc.edu/YLP/97-98/97-98_units/97-98mini-unit/MCurtiss_FiveSenses/table_content.htm

Teacher Planet- Main page of activities related to the five senses:

<http://www.teacherplanet.com/resource/senses.php>

Alphabet Soup-Five Senses Activities-

<http://www.alphabet-soup.net/me/senses.html>

Exploratorium-Sense of Taste Activity-

http://www.exploratorium.edu/snacks/your_sense_of_taste/

CT Science Standard 5.2- Senses

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Literature Links

Children's Books:

Berger, Melvin. See, Hear, Touch, Taste, Smell. 1993. Newbridge Communications, Inc. NY. (ISBN: 1-56784-009-4)

McMillan, Bruce. Sense Suspense: A Guessing Game for the Five Senses. 1994. Scholastic Inc. USA. (ISBN: 0-590-47904-0)

Parker, Steve. How the Body Works. 1994. Dorling Kindersley Limited. London. (ISBN: 0-89577-5751)

Scholastic Reference. All About People. 1995. Scholastic Inc. Hong Kong. (ISBN: 0-590-47525-8)

Showers, Paul. The Listening Walk. 1961. Thomas V. Crowell. NY. (ISBN: 0-690-49663-X)

Smith, Kathie Billingslea, and Victoria Crenson. Seeing. 1988. Troll Associates. Manwah, NJ. (ISBN: 0-8167-1008-2)

Suzuki, David. Looking at Senses. 1991. John Wiley & Sons, Inc. US. (ISBN: 0-471-54751-4)

Teacher Resources:

Berger, Gilda. Teaching Guide: See, Hear, Touch, Taste, Smell. 1993. Newbridge Early Science Program.

Martin, Paul D. Messengers to the Brain: Our Fantastic Five Senses. 1988. National Geographic Society. Washington, D.C. ISBN: 0-87044-499-9.

Levenson, Elain. Teaching Children about Science. 1985. Prentice Hall, Inc. Englewood Cliffs, NJ. (ISBN: 0-13-891730-2)

Poppe, Carol A., and Nancy A. Van Matre. Science Learning Centers for the Primary Grades. 1985. The Center for Applied Research in Education, Inc. West Nyack, NY. (ISBN: 0-87628-749-6)

Videos

Videos Included in Science Center Visit

This website gives information on the cell phone ring that only young people can hear.

http://www.nytimes.com/2006/06/12/technology/12ring.html?_r=1

Video of hearing test- Audiologists are trained to diagnose, manage and/or treat hearing or balance problems. An audiology technician would help perform a hearing test.

<http://www.careflash.com/video/hearing-test?lc=en>

Video of the best optical illusions:

<http://www.colorcube.com/illusions/illusion.htm>

<http://visualefunhouse.com/> (various 3D optical illusions including chalk drawings, include Flaming Streets http://visualefunhouse.com/chalk_drawings/flaming-streets-of-chalk.html)

http://www.metacafe.com/watch/1677404/the_best_optical_illusions/

Optometrist discussing vision therapy:

<http://www.brighteyesnews.com/category/vision-therapy/>

Video of CT:

<http://www.mayoclinic.com/health/ct-scan/MM00088>



CT Science Standard 5.2- Senses

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Additional Videos of Health Careers

Ear, Nose and Throat Physician (ENT)-

<http://www.youtube.com/watch?v=wjRsa77u6OU>

Nasal Endoscopy-

<http://www.youtube.com/watch?v=wjRsa77u6OU> (shown to students per age level and teacher discretion)

Audiologist- <http://www.youtube.com/watch?v=3tjovzqTNCs>

On-line color vision test-

<http://colorvisiontesting.com/online%20test.htm#demonstration%20card>

Ophthalmologist, Dr. Nancy Chew-

<http://science.education.nih.gov/LifeWorks.nsf/Interviews/Emily+Chew>

Genetic Counselor-

<http://www.empowher.com/media/video/video-genetic-counselor-kimberly-banks-what-genetic-counselor>

Optometrist vs. Ophthalmologist vs. Optician -

<http://www.youtube.com/watch?v=igpejGDmtcE>



CT Science Standard 5.2- Senses

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Classroom Kits

Catalogs for Teachers-extensive listing of catalogs that include classroom kits related to the senses

[http://www.catalogs4teachers.com/?_utma=1.102936767.1281458472.1281458472.1281458472.1&_utmb=1.4.10.1281458472&_utmc=1&_utmh=-&_utmz=1.1281458472.1.1.utmcsr=bing|utmccn=\(organic\)|utmcmd=organic|utmctr=teacher%20resources%20for%20senses&_utmv=-&_utmh=19381688](http://www.catalogs4teachers.com/?_utma=1.102936767.1281458472.1281458472.1281458472.1&_utmb=1.4.10.1281458472&_utmc=1&_utmh=-&_utmz=1.1281458472.1.1.utmcsr=bing|utmccn=(organic)|utmcmd=organic|utmctr=teacher%20resources%20for%20senses&_utmv=-&_utmh=19381688)

CT Science Standard 5.2- Senses

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Software

The websites that have been listed in this package provide interactive learning activities (for free). Students are able to engage with these resources, and no additional software is required.

CT Science Standard 5.2- Senses

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Home/School/Community Connection

- You could invite parents to come to class to read a book to the students or be involved in an art activity.
- Students could write newsletters home describing their experience at the CT Science Center and what they've learned about the senses.
- Ask for parent volunteers to chaperone the trip to the CT Science Center.
- Invite different health professionals into your classroom to speak to the class about their careers.

Careers in Senses

Audiologist - assesses and treats persons with hearing and related disorders, also counsels in strategies to improve speech or hearing impairment and ways to protect our hearing.

ENT- Otolaryngology or ENT (ear, nose and throat) is the branch of medicine that specializes in the diagnosis and treatment of ear, nose, throat, and head and neck disorders. The full name of the specialty is otolaryngology-head and neck surgery. Practitioners are called otolaryngologists-head and neck surgeons.

Ophthalmologist - Ophthalmology is the branch of medicine which deals with the anatomy, physiology and diseases of the eye. The term ophthalmologist refers to a specialist in medical and surgical eye problems. Since ophthalmologists perform operations on eyes, they are considered to be both surgical and medical specialists.

Optometrist- Optometrists, also called doctors of optometry (O.D.) diagnose and treat vision problems, eye diseases and related conditions, and prescribe eyeglasses, contact lenses, and medications to treat eye disorders. They cannot perform surgery, but they often provide patients with pre- and postsurgical care. Sometimes ophthalmologists and optometrists work in the same practice and co-manage patients.

Optician- An optician is a health care practitioner who designs, fits and dispenses lenses for the correction of a person's vision.

Genetic Counselor- Genetic counselors are health professionals trained in genetics, genetic disorders, genetic testing, molecular biology, psychology and psychosocial issues, and the ethical and legal issues of genetic medicine.

Endoscopy Technician -an Endoscopy Technician is an integral member of the Endoscopy team who provides support for physicians and RN's throughout endoscopy procedures by preparing, providing and caring for instruments and equipment, obtaining specimens, and maintaining a sterile field where applicable.

CT Science Standard 5.2- Senses

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Student Resources

Safety Disclaimer:

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CT Science Standard 5.2- Senses

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Student Websites

ORACLE Thinkquest- activities related to all five senses-

<http://library.thinkquest.org/3750/smell/smell.html>

Experiments to Try with the Senses-

http://kidshealth.org/kid/closet/experiments/experiment_main.html

Challenge- series of questions related to the senses

<http://www.bbc.co.uk/science/humanbody/body/interactives/senseschallenge/> -Sense

Click on “How We Hear” and students will have an opportunity to observe a sound wave and listen to the sounds of various animals and objects, such as cymbals-

www.wonderville.ca/vl/activities/hearing_sound.html

Activities related to the Ear-

<http://faculty.washington.edu/chudler/bigear.html>

Activities related to the sense of smell-

<http://www.cln.org/themes/smell.html>