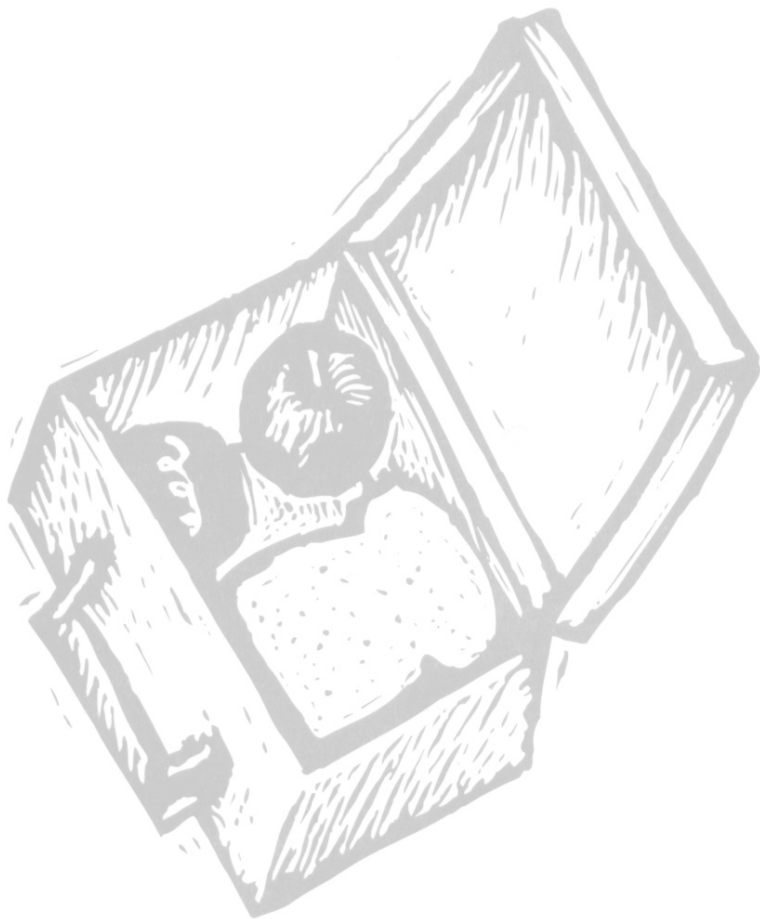


# Let's Do Science

Grade One

Senses



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## Senses Before You Begin

This unit examines the nature and various functions of our sense organs. Students learn about the capabilities and limitations of human senses and gain an awareness of the fact there are other living organisms that possess different abilities to detect and interpret the environment. Students also learn the importance of caring for their sense organs and discover how to sharpen their senses to describe as accurately as possible the information they receive.

### Topic D: Senses

(Suggested time: 8 weeks)

Before beginning this unit, send a letter to parents outlining the unit and inquiring about animal and food allergies. (See *Innovations in Science, Level 1, Sensing Your World*, p. 27.) Also, make arrangements for guest speakers, field studies or animal visits to the classroom well in advance.

This unit should be taught early in the school year (September and October possibly) so students become more aware of their senses and utilize them throughout the remainder of the grade 1 curriculum. If desired, this unit can be adapted to a centre approach.

This unit is a building block for the grade 3 unit Hearing and Sound.

## Background Information

Living organisms have evolved specialized structures that gather information from the environment. Animals from squid to frogs to humans have specialized organs that detect information about our world that is transmitted as some form of energy (light, sound, heat, etc.). The perception of this information by the brain is experienced as a *sense*. The senses are essential survival mechanisms and any organism deprived of one or more of its senses is at a serious disadvantage.

At current count, humans have a least 13 senses we experience at a conscious level and a host of senses that function at a subconscious level. To the five major senses (sight, hearing, taste, smell and touch) we can add the senses of hot, cold and pain; we can differentiate the original sense of touch into a sense of light pressure and a sense of deep pressure, and we can add a kinesthetic sense of body part location, a sense of equilibrium (balance), and the senses of hunger and thirst.

Each of these senses is associated with an organ of the body containing *receptor cells* that detect a specific type of stimulus. Eyes have receptor cells sensitive to light (photoreceptors). The mechanoreceptor cells in the ears are activated by the pressure waves created when sound waves are received by the ear. Chemoreceptors in the nose and mouth detect chemicals that trigger our sense of smell and taste, respectively. Thermoreceptors in the skin sense heat and cold, and working in close proximity to them in the skin are free nerve endings that, when stimulated, cause us to sense pain.

Receptor cells of all varieties transform their incoming stimulus—be it photons of light, vibrations or sugar molecules—into nerve impulses which travel along nerve cells to specific areas of the brain associated with each sense. For example, the occipital lobes at the back of the brain receive nerve impulses conveying visual information from the eyes, the temporal lobes on the sides of the brain are associated with hearing, and the parietal lobes toward the top of the brain interpret most of the other senses. It is these localized areas of the brain that actually interpret the incoming information into visual images, sound or the discomfort of pain.

Table 1 summarizes the location and function of each of the major senses.

## Limitations of Senses

There are definite limits to what our senses can and can't tell us about the environment. For example, human eyes can't detect light in the ultraviolet part of the colour spectrum, though many insects' eyes can, and our ears only detect sound waves in a well defined range of frequencies that does not include the very high frequencies that dogs can hear.

In addition to being limited, our senses can also be erroneous from time to time. The mix-up usually occurs when the brain makes a mistake interpreting the data receptor cells send it. For example, it is possible to

lift the same weight two times and find that it feels lighter the second time. In successive-contrast illusions such as this, a trace remembrance of the first stimulus remains in the nervous system, influencing the perception of the second stimulus. Confusion also can arise from overlapping senses. Much of what we interpret as taste can be attributed to our sense of smell, even though we perceive taste as a sensation experienced in the mouth and thus associated with taste. This explains why we lose our ability to detect flavour in foods when our nose is plugged.

## Loss of Senses

Total or partial loss of any one of the primary senses can severely hinder a person's ability to function. We have devised ways to compensate the partial loss of sight and hearing (glasses and hearing aids), but the only recourse to total loss of these senses is placement of greater emphasis on the remaining senses. Blind people obtain an enhanced knowledge of objects in their vicinity by extending their reach with a cane. They use their sense of touch to read Braille – an alphabet consisting of small bump patterns. Deaf individuals learn to read lips and use sign language to communicate.

## Animal Senses

As noted earlier, human sense limitations are not necessarily the same as the limits experienced by other animals. For example, dogs have a more acute sense of smell than humans and the vision of nocturnal animals surpasses ours at night. There are also potent chemicals some animals can smell, called *pheromones*, that trigger various responses. Some pheromones serve as potent sexual attractants. Others function as danger signals (e.g., worker ants of many species release pheromones when threatened by an invader to warn the other ants). The scent-marking substances in the urine of male dogs and cats serve as a warning signal to other males.

Some animals have entirely different sense organs than humans. The pit organs of snakes contain receptors sensitive to infrared radiation (heat), giving them the ability to detect their warm-blooded prey. Bats detect objects in their environment by emitting sound waves and sensing their reflection off cave walls, insects or trees (*echolocation*). (The frequency of these sound waves is roughly five times higher than the highest frequency human ears can detect!) Dolphins also have a form of this sense. Certain species of fish use a variant of echolocation dependent on electric *voltage* rather than on sound waves.

**Table 1. Location and Function of Each of the Major Human Senses**

<b>Sense</b>	<b>Receptor Site</b>	<b>Stimulus</b>	<b>Detects</b>
Sight	Retina at the back of the eye	Light	Light or dark and colour
Hearing	Cochlea of the inner ear	Sound waves	Different frequencies of sound
Taste	Taste buds in the mouth cavity (renewed every 7-10 days)	Chemical substances	Chemicals that relate to salty, sour, bitter and sweet
Smell (10,000 times more sensitive than taste!)	Membranes high in the nasal cavity	Chemical substances dissolved in the mucus covering the olfactory membrane	Complex mixture of chemicals resulting in fruity, flowery, resinous, spicy, foul and burned odours
Touch	Skin	Light pressure	Intensity of pressure
		Deep pressure	Intensity of pressure
Temperature	Skin	Heat	Intensity of heat
		Cold	Intensity of cold
Pain	Skin	Free nerve endings stimulated	Intensity of pain
Equilibrium	Semi-circular canals in the inner ear	Movement of fluid within the organ due to movement of the head	Acceleration, rotation and orientation within a certain plane
Hunger	Brain (hypothalamus)	Low blood sugar	Sugar in the blood
Thirst	Brain (hypothalamus)	Concentration of solutes in the body and blood pressure	Presence or absence of water in the body

# Elementary Science Program of Studies

## General and Specific Learner Expectations

The following general and specific learner expectations have been taken directly from the 1996 Elementary Science Program of Studies. The specific learner expectations (SLEs) are referred to by number in the second column of the activities table.

### General Learner Expectations

Students will be able to:

- Use the senses to make general and specific observations, and communicate observations orally and by producing captioned pictures.
- Describe the role of the human senses, and the senses of other living things in enabling perception and action.

### Specific Learner Expectations

Students will be able to:

1. Identify each of the senses and explain how we use our senses in interpreting the world.
2. Identify ways that our senses contribute to our safety and quality of life.
3. Apply particular senses in identifying and describing objects or materials provided, and describe living things and environments. Students meeting this expectation will be able to describe characteristics such as colour, shape, size, texture, smell and sound.
4. Recognize the limitations of our senses, and identify situations where our senses can mislead us; for example, feeling hot or cold, optical illusions, tasting with a plugged nose.
5. Recognize that other living things have senses, and identify ways various animals use their senses; for example, sensing danger, finding food, recognizing their own young, recognizing a potential mate.
6. Describe ways that people adapt to limited sensory abilities, or to the loss of a particular sense; for example, colour blindness, inability to see objects at close range.
7. Describe ways to take care of our sensory organs; in particular, our eyes and ears.

## Cross-curricular Connections

## Children's Alternative Frameworks

### Music

- hearing

### Art

- touching and seeing

### Health

- tasting and body care, safety care of sense organs especially ears and eyes

### Language Arts

General Outcome 3: Record Information

- Students survey the class to find out which fruits the class prefers in order to make fruit kabobs. They ask questions like, "Do you like bananas, apples or grapes?" The class graphs the responses and determines how much of each fruit is needed to make enough kabobs for everyone in the class.

### Drama

- Smell is one of the most evocative of senses. With the scent of mint, citrus, tar or fresh mown grass, children can recall and imagine situations with these scents and can dramatize actions where these scents are involved. For example, toothpaste and brushing teeth are recalled with the scent of mint, and the actions of getting up in the morning and getting ready for school can be dramatized.

### Mathematics

- seriate textures from roughest to smoothest
- listen for pattern in music

Children may believe that the five major sense organs—eyes, ears, nose, tongue and skin, corresponding to sight, hearing, smell, taste and touch—are all that is involved in the function of these senses. They do not realize the involvement of the brain and think of its role only for thinking.

## Activities

Classroom teachers have identified the following activities that address the Specific Learner Expectations (SLEs) in the Program of Studies. The list is not prescriptive and teachers may select activities that are most appropriate for their students.

Activities have been listed under two headings: Key Activities and Extension Activities. Key activities are supported by authorized resources and identify “powerful and practical” means for achieving learner expectations. Extension activities represent alternative ways of achieving or supporting learner expectations.

### Key Activities

Key Activity	SLE	Print Resources	Essential Materials	Comments
Using the five senses to identify objects hidden in paper bags	1,2, 3	<i>Innovations in Science, Level 1, Sensing Your World (Making Sense)</i> , p. 5  <i>Explorations in Science, Level 1, Coming to Our Senses (Free Exploration)</i> , p. 6	paper bags, variety of small objects (beans, pencil, eraser, paper clips, etc.), small squares of paper  small containers, objects that smell, make noise, have texture, etc.	This activity introduces the senses and allows the teacher to determine what the students know about their senses. The students are encouraged to bring mystery objects from home.
<b>Touch</b>				
Identifying, then classifying objects using the sense of touch	3, 4	<i>Innovations in Science, Level 1, Sensing Your World (A Touching Experience)</i> , p. 12	chart paper, crayons, peanuts, paper lunch bags, textured objects	For a show and tell activity, students who bring a mystery object (in a bag) must provide three pieces of information before the class can guess. <ul style="list-style-type: none"> <li>• What is it made of?</li> <li>• How does it feel? (smell? sound? taste?)</li> <li>• What colour is it?</li> <li>• Other types of information would be appropriate as well.</li> </ul>
Collecting and describing objects with different textures	3	<i>Explorations in Science, Level 1, Coming to Our Senses (Texture Trip)</i> , p. 15	cardboard objects collected by the children	

Key Activity	SLE	Print Resources	Essential Materials	Comments
<b>Hearing</b>				
Listening to pre-recorded sounds and trying to identify what they are	1, 2, 3, 4	<i>Explorations in Science, Level 1, Coming to Our Senses (Hearing Things)</i> , p. 11	tape recorder, chart paper (to draw the sounds), blank tape	Students can also tape record some of their own sounds (possibly farm animal sounds) for their classmates to identify or guess who is speaking.
Identifying and classifying different sounds	3, 4	<i>Explorations in Science, Level 1, Coming to Our Senses (What Do You Hear)</i> , p. 10; line master 1  <i>Innovations in Science, Level 1, Sensing Your World (Hear, Here!)</i> , p. 15	opaque containers with lids that are labelled 1-5, mystery objects such as sand, blocks, marbles, buttons, crayons	Students can work in small groups to draw pictures of their guesses. They should also try to print the names of their guesses.
<b>Vision</b>				
Providing detailed descriptions of objects by using sight and other senses	1,3	<i>Explorations in Science, Level 1, Coming to Our Senses (Look at It)</i> , p. 17  <i>Explorations in Science, Level 1, Coming to Our Senses (Sight Walk)</i> , p. 18	various fruits and other objects, magnifying lenses	The teacher can write key words on the blackboard. When the pictures are finished, the key words should be reviewed and the children should check to see how many details they included.
Learning to appreciate vision and challenges faced by the visually impaired	2, 6	<i>Innovations in Science, Level 1, Sensing Your World (The Eyes Have It)</i> , p. 22  <i>Explorations in Science, Level 1, Coming to Our Senses (Getting Along Without Our Senses)</i> , p. 21	blindfolds, ball of wool	<b>Caution:</b> ensure there are no sharp or dangerous objects in the students' surroundings.  The students can try to act out some of the difficulties they brainstormed.
<b>Smell</b>				
Attempting to identify unknown substances using only the sense of smell	1, 2, 3, 4	<i>Explorations in Science, Level 1, Coming to Our Senses (Smell Sort)</i> , p. 13  <i>Explorations in Science, Level 1, Coming to Our Senses (Match the Smell)</i> , p. 14  <i>Innovations in Science, Level 1, Sensing Your World (Nobody Nose)</i> , p. 18	containers (with perforated lids), spices, orange peels, soap, perfume, lemon juice, bubble gum, onion, cotton balls, etc.	<b>Caution:</b> this is a good time to teach children how to smell science materials by waving their hand across the top of the container toward their nose.

Key Activity	SLE	Print Resources	Essential Materials	Comments
<b>Taste</b>				
Using the sense of taste to identify mystery substances	1, 3, 4	<i>Innovations in Science, Level 1, Sensing Your World (On the Tip of My Tongue)</i> , p. 9  <i>Explorations in Science, Level 1, Coming to Our Senses (Taste Test)</i> , p. 19 and line master 2	sugar, salt, cinnamon, iced tea, chocolate powder, Jell-O-mix, cups, toothpicks, water, icing sugar, salt, drink crystals, pill bottles, paper, lunch bags	<b>Caution:</b> before beginning the taste experiments make sure the students are not allergic to any of the substances. Also, the students should sip water between samples.
Tasting and classifying substances as to whether they are sweet, salty, sour or bitter	3	<i>Explorations in Science, Level 1, Coming to Our Senses (Taste Sort)</i> , p. 20	salty foods (sunflower seeds, salted peanuts, popcorn), sweet foods (apple, candy, sugar donuts), cups, plates, water, toothpicks	<b>Note:</b> be aware of student allergies. Students should not have to try the foods.
<b>Animal Senses</b>				
Learning about the special sensory abilities of some animals	5	<i>Critters: Life Science, Warming Up to Worms</i> , p. 39  <i>Critters: Life Science, Reaction to Light</i> , p. 53  <i>Critters: Life Science, Reaction to Touch</i> , p. 54  <i>Explorations in Science, Level 1, Coming to Our Senses (Science Magazine)</i> , p. 20	earthworms, paper towels, magnifiers, shallow box	<b>Note:</b> ethical considerations for care of living things.  Make articles a focus of a class discussion on how we, and other animals, use the sense of hearing.

## Extension Activities

Extension Activity	SLE	Print Resources	Essential Materials	Comments
Using all five senses to discover popcorn			popcorn, popcorn popper, paper cups, napkins, salt, empty box to cover popper	Prepare the popper while the children are out of the room. Place it on a low table and cover it with a box. Allow them to hear what is happening before they see it. How have their senses helped them to learn about popcorn?
Watching a show with the sound turned off, then discussing what the show was about	6	<i>Science Through Children's Literature</i> (Butzow), p. 113	television, children's show	Try to show a science program. This activity can be extended by playing charades.
Making a texture rubbing by placing leaves or string under a piece of paper	3		leaves, string, crayons, other textured surfaces	
Playing the hearing game	2, 4, 6	<i>Explorations in Science, Level 1, Coming to Our Senses (One Ear – Two Ears)</i> , p. 12	small container filled with beans or rice	This activity is best done in a large open space.
Adapting the classroom environment for a visually impaired person	6	<i>Explorations in Science, Level 1, Coming to Our Senses (Getting Along Without Our Senses)</i> , p. 21	macaroni, paper, glue, Plasticine	
Preparing soup, cookies or other foods and using the senses to describe both the starting materials and final product	2, 3	<i>Explorations in Science, Level 1, Coming to Our Senses (Looks, Smells and Tastes Great!)</i> , p. 22 and line master 3	measuring tools, bowls, utensils and all of the ingredients necessary to prepare the chosen recipe	This activity is best done with the help of several parent volunteers. This integrates with language arts (following directions) and math (measuring).
Tasting unusual fruits and vegetables, and making a food diary	2, 3		sugar beet, sweet potatoes, mango, papaya, napkins	<b>Caution:</b> check for student allergies. Discuss the poison control centre or 911. Have the students pinch their nose and close their eyes so that they are only using their sense of taste.

Extension Activity	SLE	Print Resources	Essential Materials	Comments
Writing poems or making student books about the senses		<i>Innovations in Science, Level 1, Sensing Your World (Sensational!), p. 25</i>  <i>Explorations in Science, Level 1, Coming to Our Senses (Books About Senses), p. 23</i>	paper coffee filters, variety of textured fabrics, scents, noisy objects like pop bottle caps, cotton balls, sandpaper  stiff paper, fabric swatches, paper of different textures, cotton batting, materials as requested by the children	
Visiting with someone who can discuss how to care for the ears and eyes and why hearing and vision are important	7			<b>Note:</b> correlate with health curriculum.
Studying the bat, an animal that has poor vision but excellent hearing	5, 6		reference books about bats	The bat uses echolocation to catch its prey and avoid unseen obstacles.

## Assessment

For a broader discussion of science classroom assessment techniques see *Assessing Student Learning* in the introduction of this publication on p. 15. Good places to begin looking for the unit-related ideas are the *Explorations in Science* assessment handbooks, *Innovations in Science* teaching notes, Unit tests and Portfolio ideas, Alberta Education sample tests at [www.education.gov.ab.ca](http://www.education.gov.ab.ca) and Alberta Assessment Consortium at [www.aac.ab.ca](http://www.aac.ab.ca)

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