YALE NATIONAL INITIATIVE
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Curriculum Units by Fellows of the National Initiative
2009 Volume VI: The Brain in Health and Disease

Sensing Our Five Senses

Curriculum Unit 09.06.02, published September 2009
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Introduction

That we learn from our environment seems obvious. We rely on our five senses to provide information about the world around us. The thought of a holiday dinner brings to mind the delight of many senses - the smell of dinner cooking, the sound of holiday music, the taste of fresh baked sweets, and more. Experiences like this engage our senses—taste, smell, sight, sound, touch. In fact, at every moment of our day, at least one of our senses is hard at work, supplying our brain with information to make decisions, be safe, enjoy ourselves and become smarter. With the information from the world we live in, or more specifically the world we are exposed to, we gain knowledge that allows us and encourages us to make choices. Many young children today are exposed to "information" from the world of computers, television, video games, and other synthesized media. Their knowledge of many things is based on limited sensorial experiences, or even experiences with the wrong sense, for example seeing food being cooked on television or watching someone petting a dog. This curriculum unit is designed to get children involved in learning about true sensorial experiences. My hypothesis is, that by giving students a chance to have these experiences, they may realize that their brains will really "grow smarter" as a result.

I am a first grade teacher in a self-contained classroom at Edgewood Magnet School in New Haven. My class consists of 26 mostly six and seven year olds with an occasional eight year old. The school has an enrollment of about 450 students with approximately 60% African-American population, 12% Hispanic population and the remaining 29% Caucasian and Asian with about half of the school qualifying for free or reduced lunch. Edgewood has a high average daily attendance rate of 96%. Our neighborhood/ magnet setting is a rewarding environment, with kindergarten through eighth grade students coming to school from a variety of home circumstances and with differences in academic levels. As a result of these variables, the children have differing levels of background knowledge and life experiences. Each classroom has a mixture of varied ethnicities, economic strata, and social and emotional strengths and weaknesses.

Rationale

All learning enters through the senses. This statement seems strong, but is impossible to refute. Teachers, responsible for learners in the classroom, need to keep this in mind as they think about their students. Our senses allow us to do great things: enjoy the taste of our food, the sound of music, the beauty of a sunny day, the softness of new moss, the sound of pages turning in a book, and much more. As a teacher in an urban setting, I am aware of my students' limited exposure to the natural world, even to the point of the limited recess time built into the daily primary curriculum. I am also aware of their diets, from the school lunch menus or prepared lunches from home, their discussions of favorite meals, where they like to eat, and who cooks dinner at night or prepares breakfast in the mornings. The busy lives of families in our time cause limitations: young children rarely get to enjoy time for independent discovery and basic exploration.

First graders learn about living organisms as a science standard in our school district. It is a terrific eight weeks for students and teachers: it opens up many new experiences for some who have not been offered the chance to have pets or care for plants. During this time the students build terrariums with various plants, worms and bugs, create an aquatic environment and care for fish, snails and plants to learn about the basics in life and growth and development. They plant an herb garden to begin growing at school and then take it home as a kitchen garden. This is a good start to learning about responsibility but it demonstrates to students that they can become responsible for their learning as well. In the unit I describe here, this foundation will begin the exploration of the senses.

It is important for the developing child to experience simple discoveries that enter through undirected exploration to fulfill an innate curiosity to learn about "stuff." Young children are naturally curious and interested and this genuine type of exploring with hands-on fun science will develop critical thinkers.

As noted in The Dana Guide to Brain Health, neuroscientists tell us that a child's brain is "especially primed for learning in the years between toddlerhood and puberty." During this period (and others) the brain really can get smarter. The abundance of axons and dendrites creates a synaptic net that captures many new experiences. With brain metabolism high and a healthy child's energy high, many researchers believe that new skills are learned easiest and most efficiently between the ages of 6 and 12. Learning language is a great example. Children easily absorb the language or languages they hear. This is a fundamental component in the educational philosophy of Dr. Maria Montessori, which is discussed in her book, The Absorbent Mind. Dr. Montessori observed that children possess limitless motivation to achieve competence within their environment and to perfect skills and understandings. Although the Montessori Method is a based on philosophy not science, recent neuroscience supports the theory that the hands-on sensorial approach to learning is intimately connected to the developing brain of a child.

Background Information

The development and health of a child's brain is an important factor in their ability to learn. As Richard Restak notes in the introduction of The Secret Life of the Brain, at the end of infancy, a child's brain contains many more neurons than it requires, and excess neurons are pruned away based on the most fundamental tenet on

brain operation: Use it or lose it. Neuronal connections are thinned out based on experience, with unused or rarely used pathways disappearing while highly used pathways flourish. Because of this process of forming and reforming connections, young children's brains develop as experiences from their environments occur.

Our Nervous System

The nervous system in our bodies works as both the decision making and communication center. The central nervous system is made up of the brain and the spinal cord. The network of nerves outside the brain forms the peripheral nervous system. Together they control the day-to-day lives we lead. Nerves branch out from the brain and the spinal cord, a bundle of nerves running up and down the spine that operates similarly to a super highway, speeding messages to and from your brain every second.

Understanding the Brain

A human brain weighs on average three pounds and can easily be held in your hands. Rather amazing when you consider that the brain lets us think, feel, choose; it governs how we breathe, our heart rate, the ability to keep our balance. It actually contains about 100 billion neurons, a number equal to the stars in the Milky Way.

Most of what we see when we look at an intact brain is the cortex. It looks wrinkled because of its many folds. These folds increase the total surface area by three times what it would be if it was smooth. [1] The cortex processes perceptions, thinking, and memory. This is the largest part of the brain and is associated with higher thinking and action. The cortex contains the physical structures responsible for most of what we call brainwork: cognition, mental imagery, the highly sophisticated processing of visual information, and the ability to produce and understand language. The cerebral cortex is divided into four major regions: the frontal lobe involved in decision making, reasoning, planning, parts of speech, movements, emotion, problem solving; the parietal lobe involved in sensory perception, movement, orientation, recognition; the occipital lobe involved in visual perception; and temporal lobe responsible for hearing, expression, and memory. [2]

In the brain layer below the surface of the cortex, a number of other specialized structures are packed: the thalamus, an important relay station for the senses, and the hypothalamus, a meeting point between the nervous system and the endocrine system, and between emotion and physical feeling. The pituitary gland, which acts on signals from the hypothalamus, produces hormones that regulate many functions from growth to reproduction. The pons and the medulla, two major elements of the brainstem, channel nerve signals between the brain and other parts of the body, controlling vital functions such as breathing and deliberate movement.

From the perspective of child development, it is helpful to look at the brain from the inside out. The brain develops roughly from the base of the skull up and outward, beginning in an embryo as a series of bulges at one end of a neural tube. These bulges develop into the hindbrain, midbrain and forebrain - divisions common to all vertebrates. Cavities called ventricles form, one on each side of the brain; these cavities are filled with cerebrosprinal fluid, which serves as a cushion for the brain.

The brainstem, the area from the spinal cord, including the medulla, the pons, and up to the midbrain, contains structures that regulate autonomic functions, which are essential for survival and not under our conscious control. This structure is in charge of controlling vital life functions such as breathing, heart beat, and blood pressure. It can be considered the simplest part of the brain: in more primitive animals, such as reptiles, the entire brain resembles our brain stem.

In the core of the brain, just above the brainstem, resides the limbic region, or what is called the emotional brain. It is responsible for the basic drives and emotions and the associated involuntary behavior that are important for survival: pain and pleasure, fear, anger, affection. Included in this region are the thalamus and hypothalamus, structures that deal with perception, movement and vital function. [3] The thalamus consists of two oval masses, one on each cerebral hemisphere that is joined by a bridge. Here is where the nerve cell bodies sort out information from four of the senses, sight, hearing, taste and touch. Only the sense of smell sends signals directly to the cortex as well as to the thalamus. Sensations of pain, temperature and pressure are relayed through the thalamus. The hypothalamus has a great many jobs despite its small size. It regulates body functions, such as digestion. It is the main point of interaction between the nervous system, which transmits information in the form of electrical impulses, and the endocrine systems, which brings changes through release of chemical hormones. It is the place where the brain translates emotion into physical response. Strong feelings such as fear or excitement generated in the mind from stimuli are transferred into a racing heartbeat or shallow breathing by the action of the hypothalamus.

The amygdalae, which act as fear centers and sentinels of emotional awareness, are almond-shaped and located on each temporal horn. [4] It is through the amydala complex that the limbic system is wired into the muscles of the face, which is where we express our emotions to each other. This is also where non-verbal information is interpreted: images, sounds, smells, but not words. The amygdale takes incoming information, compares it with past experiences, and decides the "fight or flight" response. This happens before the cortex, the thinking brain, can get involved. [5]

An important task of the emotional brain is to integrate the environmental and bodily information gathered from our senses. [6] The hippocampus, another major structure of the limbic system, is in charge of consolidating recently acquired information, the processing of short term memory. It controls how memories are stored and whether or not they can be retrieved. There are three types of memory: working, or short-term memory (the breakfast menu); declarative, or long-term memory (facts and figures); and procedural, or skills memory (playing a musical instrument).

At the back of the brain is the cerebellum (little cerebrum or little brain), a knobby projection behind the base of the brain and a key participant in planning. [7] It is the second largest portion of the brain, exceeded only by the cerebral cortex. Although not essential for movement, your cerebellum makes your moves smooth and purposeful. The outer layer of the cerebellum receives a complex array of signals from every part of your body. Signals describing your body's position and orientation arrive via the spinal cord and several areas of the brain, including the gravity sensors in your inner ear. [8] The cerebellum coordinates the brain's instructions for skilled repetitive movements and for maintaining posture and balance. [9] It has the function of relaying impulses for movement to the spinal cord, where they pass to their designated muscle groups.

Cerebrum

The cerebrum is divided into two hemispheres and integrated by the corpus callosum. The most significant feature of the cerebrum is the outer layer, the cerebral cortex, consisting of four lobes. Each of these lobes is a specialist. The specialist areas work as a unit, integrating the contributions of each lobe. The frontal lobe carries out executive functions such as decision making, the occipital lobe is responsible for vision; the parietal lobe for analysis of sensation; the temporal lobe for hearing, understanding speech and memory.

Regions of the left side of the brain gather from and govern the right side of the body and the other way around. The left side or hemisphere generally controls the ability to read, speak, and do mathematical problems. The right hemisphere is the center of musical and artistic creation and the ability to understand shape and form.

It is as though you have three brains, the first being the non-thinking brain stem with its autonomic nervous system, maintaining your vital signs: pulse, temperature and blood pressure, those things that are checked out when you first arrive at the doctor's office. Above the basal portion of your brain is the larger, animal brain, which orchestrates your emotive, instinctual behavior. In conflicts of head versus heart, this is the "voice" of the heart. The real "heart-felt" smile originates here. And above these two areas is the evolved rational brain, the cognitive cortex.

Building Blocks of the Brain

The fundamental building block of the human brain, like that of nervous systems throughout the animal kingdom, is the neuron or nerve cell. Neurons are cells with unique characteristics. The neuron conducts signals by means of an axon, a long fiber which extends out from the cell body like a single long arm. Axons may reach a short distance, a few millimeters, or longer distances, stretching across the brain or even from the spinal cord all the way down the leg to the foot. Most neurons' axons are sheathed in myelin, a fatty substance operating as an insulator that helps speed signals along. Numerous shorter arms called dendrites ("little branches") conduct signals back to the cell body. They serve as the receiving area. The site of communication between any two neurons is not direct, with one neuron touching another. Instead there is a small space between the cells called a cleft across which signals are transmitted. [10]

Because neurons do not touch one another, the signal has to leap from one to the next in a connection called a synapse. A neuron could receive signals from one other neuron or it could be connecting with literally thousands of other neurons along an almost endless number of pathways.

The process of information transfer between neurons, which occurs at the synapse, is both electrical and chemical. A small electrical charge travels the length of the transmitting neuron until it arrives at the synaptic space. A neurotransmitter, a messenger chemical, is released, travels across the synaptic space, and activates or turns on a receiving neuron. This begins another electrical charge that becomes a chemical charge and the process continues, electrical to chemical, until the signal reaches its destination.

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In addition, the development of the brain allows room for shaping by the environment. The two forces, genetic and environmental (nature and nurture), include everything from nutrition and the family setting to incidence of disease. This makes each of our brains both unique and similar at the same time.

Exploring the Senses

The sensory systems have been a wide area of research for many decades as it is possible for neuroscientists to track the sensory experience from the body to the brain. Each of the different senses has particular sense cells that function within the sensory organs. The brain receives sensory information from five sensory organs (eyes, ears, nose, tongue, and skin for touch), with each type of sensory information traveling to its own area in the cerebral cortex for processing and storage. [11]

Smell

Our sense of smell warns us of dangers, such as smoke or poisonous gases. It also helps us enjoy the flavors of our favorite food and drink. With our olfactory (another word for sense of smell) receptors, we are able to detect thousands of distinct smells. These receptors cover an area the size of a postage stamp at the roof of our nasal cavity, the hollow space inside your nose. Tiny hairs called nerve fibers dangle from these receptors, which are covered with a layer of mucus. When a smell, formed by chemicals in the air, dissolves in the mucus, the hairs absorb it and excite the proper olfactory receptors. Only a few molecules are needed to excite these sensitive receptors. Once they are stimulated, they transmit impulses to the brain. This pathway is directly connected to the limbic system, where the brain deals with emotions. Reactions to smells are rarely neutral - one usually either likes or dislikes a smell. Smells leave long lasting impressions and are strongly linked to our memories - think about fresh mown grass or grandmother's molasses cookies.

Taste

Our sense of taste protects us from eating poisonous and unsafe foods. We are likely to spit out something that tastes bad, before it has a chance to enter our stomachs. Taste also helps us to maintain a consistent chemical balance in our bodies. For example, our liking sugar and salt helps to satisfy our body's need for both carbohydrates and minerals. Eating sour foods, such as lemons, supplies our bodies with essential vitamins.

Our mouths contain around 10,000 taste buds, most of which are located on or around the tiny bumps on our tongues or in small trenches in the surface of our tongue. Each taste bud detects five primary tastes: sour, sweet, bitter, salty, and a more recent addition to the list, umami (salts of certain acids that are associated with savory flavors). Each taste bud has 50-100 specialized receptor cells. Sticking out of each receptor cell is a tiny taste fiber that checks out the food chemicals in your saliva. When these taste fibers are stimulated they send impulses to your brain. Each taste fiber responds best to one of the five basic tastes. The nerves of the tongue will send information to the taste center in the medulla, where signals will go out to the amygdale and the thalamus.

Hearing

The ear is the organ for hearing. It is divided into three parts: the outer ear consists of the ear flap and the outer ear canal, which ends at the eardrum; the middle ear, which is the cavity between the eardrum and the inner ear and house the occicles, our body's three smallest bones; and the inner ear, which is a maze of bony chambers.

Hearing begins as sound waves generated by various sources travel into the ear canal and bounce off the eardrum causing it to vibrate. These vibrations pass through three very small bones, the ossicles, which are

connected like a chain. At the end of the chain is the cochlea, a bony canal that is shaped like a garden snail and filled with liquid. Traveling through the three compartments of the cochlea, the sound arrives at the organ of Corti, which is the sensory transduction organ. The organ of Corti has hair cells that, when stimulated, begin moving and it is this mechanical movement that causes the cells to transmit the signal. The auditory nerve carries to information from the hair cells to the cochlear nucleus in the brain stem, and then on to the thalamus, which relays the information to the appropriate part of the cerebral cortex.

Vision

Eyes are the organs of sight. They are hollow fluid-filled spheres made up of three layers: the outside white sclera or cornea, the middle layer containing the iris, and the back of the eye, the retina. The retina contains millions of photoreceptor cells of two different types: rods and cones. Rods detect shades of gray and movement, are densest at the edge of the retina, and do not need a lot of light to work. We have about 120 millions rods. Cones detect color and are fewer in number, only about 7 million. They are densest at the center of the retina and need bright light to function. This explains why, when there is not much light, we see only shades of gray. These photoreceptors are the neurons that send the information from the retina to the optic nerve to the thalamus and, finally, to the cerebral cortex.

Touch

Our skin has more than 4 million sensory receptors that are especially concentrated in the hands, lips, face, tongue, neck, fingertips, and feet. The receptors are sensitive to touch, pressure, temperature and pain. While the other senses are located in specific parts of your body, the sense of touch is distributed all over the body. The sense of touch originates in the dermis, which is the bottom layer of the skin.

These sensory receptors gather information and relay electrical messages through the central nervous system to the cerebral cortex for processing and possible reaction. The areas with the densest concentration of receptors, such as fingertips or lips, are the most sensitive. Sensitivity to pain also varies for different parts of the body: very little pressure to the eye causes pain but it takes a great deal more on the palm of your hand to cause similar discomfort. When any of these receptors is stimulated, it sends messages to the brain. Touch serves as a defense mechanism for the body. The feeling of pain can warn of danger or damage - if we feel something hot, we pull away!

Strategies

Experiential Learning

The major strategy for this unit is to get the students doing hands-on sensorial experiments. I want them to be actively participating as scientists, not observing a demonstration by the teacher or looking at examples in books. The activities are designed to be experienced, not to be right or wrong, but for the students to be engaged in the enjoyment in the process as well as the product.

Differentiated Instruction

The general plan for this unit is to work on a week-by-week basis introducing the five senses, initially as a

group of senses, but then to begin working on them and learning about them more in isolation, with specific experiments and activities targeted to maximize learning. The students will use a variety of approaches, working sometimes individually and sometimes in small groups, determined by the complexity of the activity. Because these are young children with variance in levels and background, supervision and appropriate pacing for the activities will be necessary.

The eight-week unit will begin with whole group learning, introducing the concept of senses as a way of learning. Read-alouds and comprehension will be the springboard, with discussion of plans for how we will approach each week.

Cooperative Learning

The students will be given opportunities to work as cooperative groups to complete experiments. This strategy will allow students to work collaboratively taking on various roles necessary to complete the work, with a focus on success for all. Most situations will require a facilitator, a recorder of data, and a reporter of results and for some occasions other assignments based on level and design of the experiment. These will rotate as new experiments are done and jobs will rotate as experiments are repeated. These experiments will require set-up and clean up to be handled by the students, postings of data on our science wall, and serving food when they learn about taste.

Literacy and Visual Resources

Literacy and first grade go hand-in-hand. The introduction of any subject should incorporate a language arts and literacy piece as an integral part of learning that subject. Because this is a critical time for these students to be focused on learning the foundations of our language, comprehension, vocabulary, fluency, and reflection are all necessary to support for other subjects.

A common practice for primary students is to have a bank of visual resources available. This would include a word wall specific to the vocabulary necessary for our science discussion, journal writing and labeling. In addition, charts listing experiment steps with illustrations, results of completed experiments, and general illustrated reference information regarding the senses should be accessible. Picture books, fiction and non-fiction can offer an additional level of resource for students looking to further research and learn.

Field Trips

The students will have a number of opportunities to work outside of the school setting, using the local park as a resource for sensorial experiences. They will have access to several arranged nature walks with the park ranger, who encourages the students to visit. This is a unit that will be taught at the beginning of the school year to set the foundation for learning in many ways, which will allow for a great fall experience at the park. There will be a walking field trip to begin the unit, one as a follow up experiment to see how we changed perception, and a final experience, with parents and others to picnic and end our unit.

Science Journals

As we work through our experiments the students will, like any scientist, keep track of their data and findings by maintaining a journal of processes and results. This, of course, for many students will become filled with illustrations as well as some writing. These science journals will be the foundation for what will become their own published text, a reference they will be able to use in the future. As the students learn to collect, organize

and record data, reading, writing and science will come together. The students will have knowledge and use of new vocabulary, scientific terms to use in their writing, and the comprehension to discuss their findings. The journals, of course, will all be age appropriate.

Classroom Activities

Lesson One - Our Five Senses

This lesson can be used to introduce the unit on the five senses. The activity allows the students to explore and discover what is in a mystery box through the use of their five senses. I chose to read a book for reinforcement of the five senses: See, Hear, Touch, Taste, Smell by Melvin Berger. The activity can be done as a whole group or it can be modified for small group or center use.

Objectives:

1. Students will use each of the five senses in discovery of what is inside of a mystery box.

2. Students will be able to use their sense of hearing to listen to the popcorn being popped, sense of smell, sense of sight to see the popcorn, sense of touch to feel the popcorn, and sense of taste and see if their guess was right.

3. Students will discover connections between the five senses and the corresponding sense organs.

Materials:

Hot air popcorn popper

Large box to cover popper

Popcorn to pop (enough for 26 students)

Napkins/cups for popcorn

Procedures:

1. Place an air popcorn popper filled with popcorn on a table covered with a box in the classroom when the students are not present.

2. Have students sit on the carpet in front of the mystery box. Turn on the popcorn popper.

3. Ask the students how we could find out what is in the box: What does it sound like? What does it smell like?

4. Remove the box. Did the students guess correctly? Tell the students that I will be asking more questions when they get the popcorn about how it feels, tastes and sounds like. Pass out popcorn to students.

5. Ask the students what they see, feel and taste. Ask the students to describe each experience: What does it look like? What does it taste like? What sound does the popcorn make when you eat it?

6. Ask the students to try to explain what they used to find out what was under the box. 7. Briefly discuss the five senses, and the sensory organs. Talk about descriptive sense words: loud, soft, hard, rough, heavy, light, etc.

7. Quickly review: What are the five senses?

Evaluation of student learning: Through discussion after the activity, were the students able to effectively describe their experience of using their senses to figure out what was in the mystery box? Were the students also able to identify the sensory organs used? Did the students appropriately respond to the questions asked during the reading of the book.

Lesson Two - Sensory Centers

The purpose of this lesson is to raise the students' awareness of the five senses and the role the senses play in making food choices. The teacher will read a book about the senses and provide the students with a variety of center activities. This is a great opportunity to invite parent helpers could help facilitate the centers and assist in gathering the appropriate materials.

Objectives:

The students will explore the relationship between the senses and food preference; review the names of the five senses; draw and label the senses; recognize that participation in the activities involves trust.

Materials:

Foods of different sizes and textures

Adult or older student volunteers at each center

Student writing journals

Chart paper

Big Book, My Five Senses: A Lion's Tale

Procedures:

Ask the students to close their eyes while you pass something under their noses (a cut lemon, chocolate candy, coffee beans or peanut butter). Hide the smelly item from sight and discuss what they think it was. Ask them to tell you what sense they used to figure that out. Ask them what other senses they have and how they could use those senses to observe the object in a different way. For example, they could use their sense of touch to feel the shape of the lemon. They could use their sense of hearing to observe how the coffee beans sound as they drop or shake in a cup.

Read the Big Book, My Five Senses: A Lion's Tale. Discuss how the lion used his senses in the story. Tell them that they have five senses that help them observe the world. Ask the children to reflect on what their five senses are and how they use them. Encourage several children to give their responses and ideas.

Divide the class into five groups to rotate to five centers. Each center will focus on a single sense. Choose foods of different sizes, temperatures and textures (green banana/ripe banana, outside/inside of pepper,

grape, apple, grapefruit, bread, lettuce). The children will use one sense at a time to choose which food they would like to eat. The student should tally of what choices they make at their center and record any comments. (Have the foods in closed containers so children cannot see the objects in advance.) The teacher will need to signal when the groups rotate and oversee the whole process, making sure they have enough time at each center.

Centers:

Touch: Have the children handle foods with their eyes closed or blindfolded (no eating). After feeling all the choices, ask them to select one thing that they think they'd like to eat based on feel. Ask them to explain their choices. Chart their answers.

Taste: Have small samples of foods of different tastes (sweet, sour, bitter, and salty). As children sample the foods, write down their comments. Tally which foods children choose as their favorite flavors.

Smell: Have students close their eyes and use only their sense of smell to make choices. After smelling all the choices, ask them to select one thing that they think they'd like to eat based on smell alone. Have them to explain their choices. Chart their answers.

Sight: Choose items that may not be familiar to students for this center. Have students use only their sense of sight to make choices. After looking at all the choices, ask them to select one thing that they think they'd like to eat based on sight alone. Ask them to explain their choices. Chart their answers.

Hearing: Have students turn their back to the facilitator. Use foods that make noise (cold cereal, pouring milk, snapping carrots, breaking chips). See if children can identify the foods.

Evaluation: Students write in their journals about their five senses. They should draw a picture of eyes, ears, hands, mouth and nose. By each sense, they should illustrate something that was attractive to that sense. Post the words "hearing," "taste," "touch," "smell" and "sight" on the word wall or in the writing area so that students can copy the words and label their drawings. Encourage students to write about the foods they observed.

Lesson Three - Now Hear This

Plastic eggs will be filled with various objects and children will need to use their sense of hearing to figure out what is inside.

Objectives: The children will use their sense of hearing to determine the objects inside the egg. The children make guesses and check their answers.

Materials: plastic eggs, objects for inside the eggs, cotton, rice, paper clips, marbles, pennies etc., permanent marker, picture worksheets, data worksheet, scissors, glue, pencils and ears.

Procedures: Fill plastic eggs with various objects. Number each egg with a permanent marker. Explain to the class that they will shake each egg and try to guess what is inside. Show them the pictures of the objects they will be listening for. Children will shake each egg and listen. They should not open the eggs. Children will select which object they think is inside the egg and cut out the matching picture. Glue the object onto the corresponding numbered egg on the first worksheet. Continue on until all the eggs have been done. After all answers have been recorded on the worksheet, the children can open each egg to see what is inside. They

can then check their guesses. Discuss the sense of hearing and how it helped to identify the sounds inside the eggs.

Lesson Four - Tasty Smell or Not

This lesson will demonstrate the connection between the sense of smell and the sense of taste, which was introduced in lesson two. Film canisters will contain various smells and scents and the children will need to use their sense of smell only to decide - is this a tasty smell (would I like to eat this?) or not a tasty smell.

Objectives: The children will use their sense of smell to decide a tasty smell or not tasty smell. The children make their choice, guess the contents, and check their answers.

Materials: 12-15 film canisters, cotton balls, vanilla, garlic, vinegar, hand soap, onion, perfume, chocolate, lemon, peppermint, soil, data worksheet, scissors, glue, pencils and nose.

Procedures: Number each canister and create a list. Infuse the cotton balls with the various scents by placing the ingredient and a cotton ball into a plastic bag overnight. The student should see only a cotton ball when they open the canister. Explain to the class that they open each canister and gently smell the contents and decide, is it a tasty smell or not. Also at this point they may choose to write on their chart a guess of what they smell. Once all students have completed the activity, reveal the actual source of the smell from the list and graph the student's results. Discuss the fact that although some things smell not tasty, they are in fact food (vinegar) and the opposite may also be true (bubblegum scented hand soap).

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Lesson Five - Scavenger Hunt for Sensory Sleuths

This lesson will take place at the local park, with help from parents or other chaperones.This is a weather-dependent lesson and can be adjusted based on available resources. The season of fall offers a variety of natural changes that help students learn to be observant.

Objective: The students will use descriptive words to complete the senses chart on the scavenger hunt. The students will learn to read and fill in a matrix. The students will work in cooperative groups to complete their work.

Materials: local park, adult helpers, data worksheets, small ziploc bags of trail mix (variety of raisins, m&m's, cheerios, small pretzels, goldfish, etc.)

Procedure: The students will be going on a nature scavenger hunt as sensory sleuths. Explain how a scavenger hunt works, but that this hunt will only be for collecting sensory information. Generate a list of describing words (adjectives) on the board/chart paper or orally prior to the trip to help the students with resources. Divide the students into cooperative groups of 3-4 with an adult assistant/chaperone. The students are to find the items on the list to investigate and write about. Encourage them to use a variety of descriptive words and be complete on their charts. As a challenge, students may include items not on the list, adding them to the chart. At the conclusion of the lesson time, distribute the trail mix for final sensory investigation.

Evaluation: Students will complete the chart with appropriate descriptive words.

@SH:Notes

[1] Peter Rowan. Big Head: A Book About Your Brain and Your Head.(New York: Knopf Books For Young Readers), 31.

[2] The Dana Guide to Brain Health: A Practical Family Reference from Medical Experts (Washington: Dana Press), Primer.

[3] Sandra Ackerman. Discovering the Brain (Washington D.C.: National Academy Press), 16.

[4] The Dana Guide to Brain Health, 181.

[5] H.P. Newquist. The Great Brain Book: An Inside Look At The Inside Of Your Head. (Mexico: Scholastic Nonfiction), 65.

[6] The Dana Guide to Brain Health, 182.

[7] Thomas Czerner. What Makes You Tick?: The Brain in Plain English. (New York, NY: Wiley), 181.

[8] Czerner, 185

[9] Ackerman, 19.

[10] Ibid.

[11] Dana, 139

Teacher Resources

Ackerman, Sandra. Discovering the Brain. Washington D.C.: National Academy Press, 1992.

This resource provides a straight-forward and easy-to-read discussion of the brain's physical structure and functions.

American", "Scientific. Mind and Brain: Readings from Scientific American Magazine. New York: W H Freeman & Co (Sd), 1993.

Bloom, Floyd E.. Best of the Brain from Scientific American: Mind, Matter, and Tomorrow's Brain. Washington: Dana Press, 2007.

This collection of articles is accessible to the general reader, providing insight into the current state of knowledge about the human brain.

Czerner, Thomas B.. What Makes You Tick?: The Brain in Plain English. New York, NY: Wiley, 2002.

This book provides an accessible introduction to brain research with simple, readable drawings.

Doidge, Norman. The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Brain Science. Boston: Penguin (Non-Classics), 2007.

This collection of cases studies presents in an understandable way the newest information on neuroplasticity, the ability of the brain

to rewire itself.

Montessori, Maria. The Absorbent Mind. New York: Delta, 1967.

This book presents an in-depth discussion of Montessori's theory based on decades of scientific observation of children. It discusses the special mind of the child, and the importance of nurturing the potential in each child. Montessori's theories are particularly interesting today in light of recent neurological discoveries, especially those related to critical periods and language.

Restak, M.D., and Richard. The Secret Life of the Brain. Washington, D.C.: National Academies Press, 2001.

This great, thorough introduction to the development of the human brain explores five stages of brain development: gestation/infancy, childhood, adolescence, adulthood, and old age. The author focuses on sensitive periods of development.

Wooldridge, Dean E.. Sensory Processing in the Brain an Exercise in Neuroconnective Modeling. London: John Wiley And Sons, 1979.

States of Mind: New Discoveries About How Our Brains Make Us Who We Are. New York, NY: Wiley, 2001.

The Dana Guide to Brain Health: A Practical Family Reference from Medical Experts. Washington: Dana Press, 2006.

The guide is an extensive and wholly accessible manual on the workings of the human brain. It contains a wealth of facts andadvice on simple, effective ways to take care of our brains.

Web Resources

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http://www.dana.org

http://www.newscientist.com/movie/brain-interactive

http://www.pbs.org/wnet/brain/3d/index.html

http://www.teach-the-brain.org/learn/literacy/

Student Resources

Alexander, Heather. Look inside your Brain (Poke and Look). New York: Grosset & Dunlap, 1991.

Appropriate for first through third grades, this spiral-bound board book introduces the form and function of the brain, covering physiology, voluntary and involuntary actions, senses, memory, learning, and creativity.

Carle, Eric. The Mixed-Up Chameleon. New York: Harpercollins Childrens Books, 1998.

Carle, Eric. The Very Hungry Caterpillar. New York: Penguin Group USA, 1986.

Cobb, Vicki, and Vicki Cobb. Follow Your Nose. Brookfield, CT: Millbrook Press, 2003.

Curry, Don L.. How Does Your Brain Work (Rookie Read-About Health). New York: Children's Press (CT), 2004.

Simple text and colorful photos are great for encouraging children to read on their own to learn that each part of their brain has a different function.

Funston, Sylvia, and Jay Ingram. It's All in Your Head: A Guide to Your Brilliant Brain. Toronto, Ontario: Maple Tree Press, 2005.

This colorful book explains how the brain controls our senses, emotions, memory, and thinking. Each chapter includes experiments, with easy-to-find items such as buttons and jelly beans, brain teasers (the answers are in the back of the book), historical information, and current theories on brain function.

Lennard, Kate. Young Genius: Brains. Hauppauge NY: Barron's Educational Series, 2007.

Martin, Jr., Bill. Brown Bear, Brown Bear, What Do You See?. New York: Macmillan Young Listeners, 2009.

Martin, Bill. Polar Bear, Polar Bear, What Do You Hear? (Henry Holt Big Books). New York: Henry Holt And Co. (Byr), 1992.

Newquist, Hp. The Great Brain Book: An Inside Look At The Inside Of Your Head. Mexico: Scholastic Nonfiction, 2005.

This detailed and informative book has in-depth descriptions of brain processes through engaging content, interesting illustrations and diagrams, and clear, full-color photos.

Pfeffer, Wendy. Sounds All Around (Let's-Read-and-Find-Out Science 1). New York: HarperTrophy, 1999.

Rowan, Peter. Big Head: A Book About Your Brain and Your Head. New York: Knopf Books For Young Readers, 1998.

With many full-color illustrations that are clear and understandable, and life-size images of veins, glands, parts of the brain and spinal cord, muscles, and nerves, this book provides a great overview of the anatomy and physiology of the head and neck.

Simon, Seymour. The Brain: Our Nervous System. London: Collins, 2006.

This book contains large, colorful photographs and illustrations that show the areas of the human brain. These pictures are great examples to show children how doctors can see inside the body and brain using scanners and computers.

Wells, Rosemary. Noisy Nora. New York: Scholastic Book Services, 1973.

Appendix A

Scavenger Hunt for Sensory Sleuths

09.06.02.04

Appendix B

State of Connecticut Science Content Standards for Kindergarten - Grade 2

Content standards and expected performances include: (1) Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomenon; (2) Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science; (3) Scientific numeracy: mathematics provides useful tools for the description, analysis and presentation of scientific data and ideas.

A INQ.1: Make observations and ask questions about objects, organisms, and the environment.

A INQ.4: Read, write, listen, and speak about observations of the natural world.

A INQ.6: Present information in words and drawings.

A INQ.10: Represent information in bar graphs.