1. UNDERSTANDING OUR SENSES

A TEACHER LESSON PLAN

FOR NZC LEVEL 2

Complete this before your ZEALANDIA visit!

Resource Overview:

This lesson plan looks into the structure and function of senses in people and how they help us to explore, grow and survive. The plan can be used before your trip to ZEALANDIA to introduce the topic. The second plan then investigates the similarities and differences between human senses and the senses of different species, and how the senses of animals make them well suited to their environment. It has a particular focus on endemic species (ones that are only found in Aotearoa), and can be used after your trip. They link to various parts of the New Zealand Curriculum, each of which is described in more detail below.

These lesson plans are flexible, and contain basic components that you can modify to meet both the needs and the interests of your students. This first lesson is primarily about 'tuning in' – finding out what your students already know about their senses, how they feel about the topic and formulating more specific learning objectives for this unit. Then, you can engage in a handful of activities with your students based on the ones provided in this resource to help them explore the theory and mechanisms behind our senses.

This particular lesson plan will start with a focus question and lesson objectives, before moving on to background information and context, teacher theme and content and a final reflection.

NZC Curriculum Achievement Objectives: Where they pop up in this resource
Scattered throughout this lesson plan will be various NZC Achievement Objectives for a variety of different curriculum standards. They will be found in boxes such as this one, and are intended to be used as a guide. Pick and choose the activities you want to do, and the objectives you want to meet!

ZEALANDIA
TE MĀRA A TĀNE

Contents:

Lesson Focus and Objectives

Focus Question

How do our senses help us to navigate and understand our world?

Lesson Objectives

Note: These are broad objectives that you can modify after an initial brainstorm about senses with your students, depending on their interests and needs.

By the end of this lesson students can:

- Name the five main senses in humans.
- Understand and participate in collaborative conversations about how the five main senses help people to navigate the world around them, and survive.
- Understand that people might experience the five main senses differently, building empathy for people around them.
- Identify unnamed objects using their own senses.

Key Vocabulary

Sight, hearing, touch, taste, smell, receptor, depth perception

Background Information and Context

Our senses are a vital way of learning about and understanding our world. Every second, our bodies receive vast amounts of information from our environment - information which our brains need to process and respond to in order for us to survive. There are five traditionally recognised senses that help us to gather all of this information – sight, hearing, taste, touch and smell. However, scientists that study our senses say there could be between 10 and 30 senses that we experience, such as response to temperature and pain. There are also a variety of senses we do not experience that other organisms do, for instance, magnetoreception that allows animals such as turtles to detect the Earth's magnetic field.

Science: Nature of Science - Understanding about science
Mentioning that there are more senses that we traditionally recognise, and that scientists are working to understand them will help students appreciate that scientists ask questions about our world that lead to investigations.

A sense is broadly defined as: "a specialized function or mechanism by which an animal receives and responds to external or internal stimuli", by the Merriam-Webster dictionary. This lesson will focus on the five traditionally recognised senses, but since this definition is so broad there is scope for you to talk about others with your students if you wish.

For children, exploring natural areas involves interactions with and applying all of their senses. It is thought that this combination of the outside world and sensory inquiry helps to foster curiosity, understanding of wildlife, and a drive to discover. This could be as simple as going out onto the school field and seeing what is there!

Resources Online for more Background Information:

- For an introduction into the five main senses and current sensory research projects in Aotearoa: https://www.sciencelearn.org.nz/resources/2079-our-senses-introduction
- For information about the sense of touch and the structures that make it possible in humans: https://learning-center.homesciencetools.com/article/skin-touch/
- For information about linked senses, such as smell and taste: https://courses.lumenlearning.com/boundless-biology/chapter/taste-and-smell/
- For an age-appropriate video on the five main senses (made by the Dr. Binoc): https://www.youtube.com/watch?v=q1xNuU7gaAQ
- For a video on the five main senses, and their relationship with our memory: https://www.youtube.com/watch?v=eAOuNaARmZM
- For a Ted-Ed video about how to master our sense of smell: https://ed.ted.com/lessons/how-to-master-your-sense-of-smell-alexandra-horowitz

Teacher Instructions: Theme and Content

Note: The activities in this lesson plan cover a broad range of senses to be inclusive of students with a variety of sensory abilities.

Tuning In – Introducing the Concept of Senses and Learning Outcomes

Before launching into any activities, introduce the topic of the five senses to your students. This is an opportunity to see how much your students understand about their senses, in a format that works for you. You could have a class discussion that prompts the students to recall what senses are, how many we have, what we use them for and the structures we have that allow us to experience these senses. Or, students could work in pairs or groups to brainstorm what they already know about senses. From here, you can run through what you have discussed to clear any misconceptions and provide more detail on how our senses work.

Possible discussion points:

- Our senses do not exist in isolation from each other, which can also be an interesting point of discussion.
- Have you noticed that when you get sick, food doesn't taste quite the same? This is because our taste and smell work together to enable us to detect flavour. Humans can taste things that are sweet, sour, bitter, salty and umami (savoury), but we need a functional sense of smell to do so.
- We also often think of sight as being our dominant sense, but we use information gathered by our ears and nose, as well as tactile information to understand and function in the environment around us.

Once you have established what your students know and what they are interested in, you can develop learning objectives that work for both you and them to place an emphasis on student-led inquiry. Or, you can use the ones provided in this lesson plan.

Science: Nature of Science - Participating and contributing
The initial discussion of this topic can let students explore and act on issues and questions that link their science learning to their daily living.

Introducing the "Big Idea"

Note: Depending on how in-depth you go with your brainstorm and discussion about senses with your students, you may wish to introduce some activities that explore their initial understanding of senses in another session entirely.

Big Idea: How do our senses help us to navigate and understand our world?
- What are our five main senses?
- How do they work?
- How can they help us to navigate and understand the world we live in?

The following are a set of different activities you can carry out with your students to explore their initial understanding of senses. They are listed below for your convenience, so you can jump to ones that suit you. Feel free to adapt as necessary, for what works for you and your class.

Science: Living World – Ecology
The exploration of senses will help students to recognise that living things are suited to their particular habitat.

Identify that Object!

An activity that uses all of the senses, and can be done with the whole class or in smaller groups.

Preparation
- A paper bag
- An item of food (something that is fragrant, noisy and textural will be ideal, like popped popcorn) Note: (If you want to carry this out with multiple items of food, then you will need to set up individual paper bags for each one)
- At least five volunteers
- For extension: gloves, pegs or cottonballs (something that you can block the nose or impair other senses with)

Instructions
- Place the item of food into the paper bag before class, or without the students seeing.
- Without telling them what it is, have a student reach into the bag and identify what is in it through touch alone. Students can write down their answers without telling other students what they think the object is.
- The next student can smell the bag and try to identify what is in it (you might have to get them to close their eyes so they don't see what is inside).
- Another student can shake the bag to try and identify what is it in it.
- The last student can look into the bag and reveal to everyone what is in it.
- Note: You can get a student to taste what is in the bag without looking at it.

Science: Nature of Science - Investigating in science
Getting the students to use other senses to investigate the contents of the bag enables them to extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.

Reflection:
Did any students correctly guess what was in the bag without looking at it first? This is a good discussion point about how we can engage all of our senses to figure out the world around us, we don't always have to rely on sight alone.

Extension:
Repeat the same activity, but this time with the senses impaired. Is it harder to determine what the object is if you have gloves on, and you can only use your sense of touch? Can you still tell what it is even if your nose is pegged? What if you closed your eyes and only had your sense of touch to help you determine what the object was – is that more difficult?

This an opportunity to talk about how we can still understand what is going on around us with impaired senses, it might just take some time. People with sensory impairments often have elevated experiences of other senses instead.

Health and Physical Education: Relationships with other people - Identity, sensitivity, and respect
By considering how senses can differ between individuals, it will help students to describe how individuals and groups share characteristics and are also unique.

Health and Physical Education: Relationships with other people – Relationships
Working as a group in this activity and reflecting on the activity helps students identify and demonstrate ways of maintaining and enhancing relationships between individuals and within groups.

Are our Eyes Playing Tricks on Us?

These activities explore our sense of sight. They can be carried out in class, or demonstrated with the whole class.

Preparation
- A ball, or
- pencils for each student (or anything similar the students have in their pencil cases)

Instructions
- Get the students to hold their pencils on their side, one in each hand.
- Have them hold their arms out in front of them, close one eye and try touch the ends of the pencils together (preferably not the pointy ends).
- Repeat with both eyes open.

Alternatively, get the students in pairs.
- Get them to roll a ball between them.
- Now, get them to cover one eye and roll the ball to their partner.

Health and Physical Education: Movement concepts and motor skills - Movement skills.
Completing the ball activity helps students to practice movement skills and demonstrate the ability to link them in order to perform movement sequences.

Science: Nature of Science - Investigating in science
These practical activities help students to extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.

Reflection:
What was easier, touching the ends of the pencils together or rolling the ball with one eye open, or both eyes open? Why do you think that is?

Having two eyes helps us to determine how near or far away objects are, which is known as depth perception. Touching the ends of the pencils together or rolling the ball with one eye closed is often harder than it is with both eyes open.

Smell That!

This activity focuses on our sense of smell, and can be carried out in groups, or demonstrated with the whole class.

Preparation:

- You will need:
  - A blindfold
  - A selection of small, lidded containers that you can't see through (alternatively, jars that you could stick a bit of paper around to hide their contents)
  - A selection of different smelly things, such as dirt, pencil shavings, citrus, a cotton ball soaked in perfume or essence, rose petals, garlic, ginger

- Then, make sure the students won't be able to see the contents inside the jars or containers.
- Put your 'smelly things' in the different covered jars/containers.
- Poke a series of holes into the lids of the jars/containers (or cover the top of the lid/ container with tin foil or paper, and poke holes in that instead).
- Label the bottom with what is inside.
- Gather a number of volunteers.

Instructions:

- Blindfold your first volunteer.
- Have the volunteer smell the container, and get them to guess what is inside (you could record the guesses on a piece of paper or the board)
- Reveal what is inside the container to see if the student was correct. Alternatively, you can repeat the above steps on different students to see what they think it is (if you do this, perhaps get the students to record their own answers on their own piece of paper and reveal them once everyone has had a sniff, so that they don't get skewed by what the first person says).
- Repeat until you have gone through all your smells.

Science: Nature of Science - Investigating in science
These practical activities help students to extend their experiences and personal explanations of the natural world through exploration, play, asking questions, and discussing simple models.

Health and Physical Education: Movement concepts and motor skills - Positive attitudes
Participate in and create a variety of games and activities and discuss the enjoyment that these activities can bring to them and others.

Reflection:
Here you can discuss whether some objects have stronger smells than others, whether people might smell things differently, and why things might smell 'good' or 'bad' to us. It's also an opportunity to link smell to our memory – do any of these smells remind you of anything?

Identify that Object!

This whole-class activity focuses on our sense of hearing.

Preparation:

- You will need:
  - A blindfold
  - A bell (or similar object that creates noise)

Instructions:
- Get the class to sit in a circle – this is an activity that would be great to do outside on a nice day!
- Select one volunteer. Get the student to sit or stand in the middle of the circle. This student has to then close their eyes or be blindfolded.
- Give another student the bell or noisy object, without giving away who this is to the student that is blindfolded.
- Once everyone is ready, get that student to ring the bell.
- The student that is blindfolded has to determine who has the bell – or they can say what direction the sound is coming from (good place to use Māori direction words – whakamua (forwards), whakamuri (backwards), whakamauī (to the left) and whakamatau (to the right).
- Change the student in the middle and pass the bell on, then repeat!

Learning Languages: Language knowledge
By using these phrases, students will recognise that the Māori language is organised in particular ways.

Reflection:
Do you think we have a good sense of hearing? Was it easy or difficult to tell where the sound was coming from? How does the placement of our ears help us to pick up sound? Having ears on each side of our heads helps us with directional hearing.

Extension:
While playing this game, you could try to get the student that is ringing the bell to ring it loudly or softly. How does this affect our ability to tell where sound is coming from?
What happens if the student in the middle cups their hands around their ears with their thumbs pointing upwards? Does this help them identify where the sound is coming from? Cupping the ears helps to amplify sound.

Mystery Box - Touch

This activity can be carried out with the whole class, or in smaller groups.

Preparation:
- You will need:
  - A medium-sized cardboard box or a pillowcase
  - Scissors
  - A sock or glove
  - Items to fill the box or pillowcase (you can use items found around the classroom, for example, a ball, cup, pen, glue stick, real stick, feather...)

- If you are using a pillowcase for this activity, pop all of the objects you have selected into it. If you are using a cardboard box, cut an arm-sized hole in one end – big enough so that the students can reach in and feel what is inside without seeing it first. Then, add in the objects.

Instructions:
- Have the students reach into the pillowcase or the cardboard box with their hands, and try to identify the objects.
- Can the students name the objects in the box or pillowcase in Te Reo Māori? I.e. paoro (ball), kapu (cup), pene (pen).
- Let the students look into the pillowcase or box.
- Is it easier to identify these objects with just touch, or when all senses are restored?

Reflection:
How difficult is it to rely on your sense of touch alone to identify items? Do you think that your sense of touch could get more sensitive if you had to rely on it more?

Extension:
Attach the sock or glove into the inside of the cardboard box with strong tape, so that the students can put the sock or glove on their hand and reach into the hole. Get the students to repeat the activity, but with the sock or glove over their hand. Feel free to put different objects into the pillowcase or box if you have them, to make the second round of the activity even harder. Alternatively, you can cut another hole in the other end of the box so that you can carry out both versions of this activity at the same time.

- Now, get the students to try and identify the items when wearing a glove or a sock over their hand. How many can they identify?

Overall Reflection on an Introduction to Senses

In a format that best suits you and your students, prompt reflection of how the student's knowledge of senses has changed since you first introduced the big idea.

This could be in the form of a discussion, or perhaps the students create a story, performance or art-work of their new knowledge.

Based on the level of knowledge about senses they possess and what they are interested in, you can use this to tinker with your overall learning objectives for this unit or tailor the next lesson plan to suit your and student needs and interests.

The arts: Dance - Communicating and interpreting
Summarise their understanding of senses by sharing dance movement through informal presentation and identify the use of the elements of dance.

The arts: Drama - Developing ideas and Communicating and interpreting
Summarise their understanding of senses by developing and sustaining ideas in drama, based on personal experience and imagination, and share drama through informal presentation and respond to elements of drama in their own and others' work.

The arts: Visual arts – Developing ideas
Investigate and develop visual ideas in response to a variety of motivations, observation, and imagination, focused around senses.

English: Speaking, writing and presenting – Ideas
Select, form, and express ideas on a range of topics, focused around evaluating their knowledge of senses.

NZ Curriculum Values and Key Competencies

Values:
During this lesson, students will be encouraged to value excellence, innovation, inquiry and curiosity, diversity, equity, community and participation, ecological sustainability, integrity and respect.

Key Competencies:
Thinking, using language, symbols and text, managing self, relating to others, participating and contributing.

Quick Facts on Senses (Optional Information)

Touch:
Sensory receptors on our skin detect what is happening on our body's surface and send signals to our brain, which gives us information about the external environment. These receptors are responsible for telling us what is happening on the surface of our bodies, such as detecting pain and temperature. For more information about the sense of touch:
https://www.sciencelearn.org.nz/resources/1892-touch

Sight:
Our eyes are made up of many different components which allow us to detect shapes, light and colour. These parts, such as the lens, cornea, iris, rods and cones, help to take information from the world around us and send the information to the brain – which then processes the information, allowing us to comprehend what our eyes are telling us. About the size of a ping pong ball, our eyes sit in our eye sockets, which is a hollow area at the front of our skulls. Sight is our most heavily relied-upon sense, but people without it may experience an enhancement of the senses they do have. For more information about the parts of the eye and their function:
https://www.livescience.com/60752-human-senses.html
https://kidshealth.org/en/kids/eyes.html

Hearing:
Our ears are made up of three main parts – the inner, middle and outer ear. These parts work together to help up pick up sounds coming from the environment around us. Our inner ears are also important for our balance. For more information about the structure and function of ears:
https://www.sciencelearn.org.nz/resources/1888-human-hearing

Taste:
Our sense of taste can tell us numerous things about the food we put into our bodies – such as whether there are any toxins present or whether there is nutritional value in the food we consume. Our tongues and the taste buds on them are responsible for taste. How scientists think our tongues detect taste has changed with time, which is a good discussion point if you wish to cover the Nature of Science achievement outcomes. For more information about tongues, taste and how scientists understand taste:
https://www.sciencelearn.org.nz/resources/1890-taste

Smell:
Our sense of smell is due to cells called smell receptors. These receptors in our nose pass the information to our brain, which then processes the smell and enables us to recognise it. We have approximately 40 million smell receptors which can help us to identify up to a trillion smells, many of which are linked to our emotions or memory. For example, we can think of smells that we associate with different memories, and some smells can cause us to experience different emotions. Some people have different sensitivities to certain smells than others. For more information about smell and psychology:
http://www.fifthsense.org.uk/psychology-and-smell/