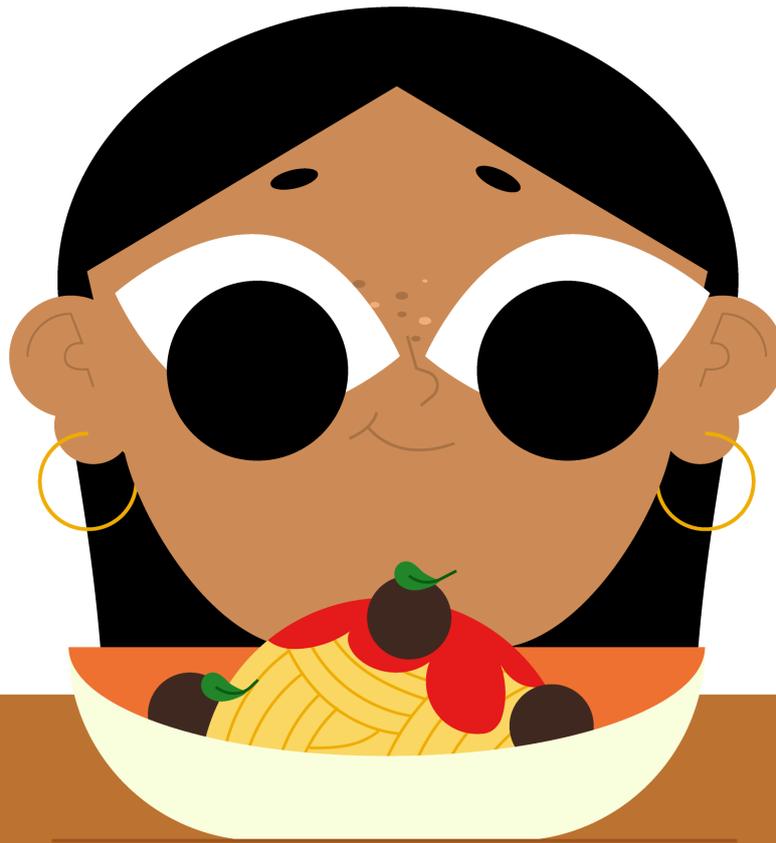


Extra Sensory

Year 8 Science

Year 9 Science



(Science, Yr 8, ACSHE134)

Scientific knowledge has changed peoples' understanding of the world and is refined as new evidence becomes available

(Science, Yr 8, ACSHE136)

People use science understanding and skills in their occupations and these have influenced the development of practices in areas of human activity

(Science, Yr 9, ACSSU175)

Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment

(Science, Yr 9, ACSHE157)

Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community

(Science, Yr 9, ACSHE160)

People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities

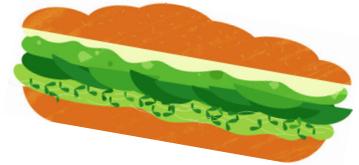
Extra Sensory

There are five senses, right?

From the earliest age we learn that we have these senses in our human toolkit: hearing, sight, taste, touch and smell. But what if that wasn't the picture?

In the related Nomcast, Alice talks about new discoveries in the world of tastes, as new kid on the block *umami* joins salty, sweet, bitter and sour. Five – senses and tastes – feels like a tidy number, but scientists are increasingly investigating complexities in human systems and proposing new ways of looking at long-held truths. Maybe with the five senses, we need to think differently, too.

This lesson exposes students to different ways of looking at commonly held understandings, and how and why science seeks to look harder for an understanding of how humans work.



Equipment:

For use before the class:

an onion

a knife and chopping board

a microwave

a heat-proof dish with a lid



Just before the class

Peel and slice or chop the onion.

Put it in a microwave-proof bowl, add a tablespoon of water and microwave for 2–2.5 minutes.

Put the hot, fragrant-smelling cooked onion into a heatproof container with a tightly fitting lid.

You can do this up to a day in advance and keep it in the fridge, but the lesson will go better if you have a chance to pop the container back in the microwave and warm it up just before the class.

Duration:

30 minutes plus perhaps time for projects or presentations

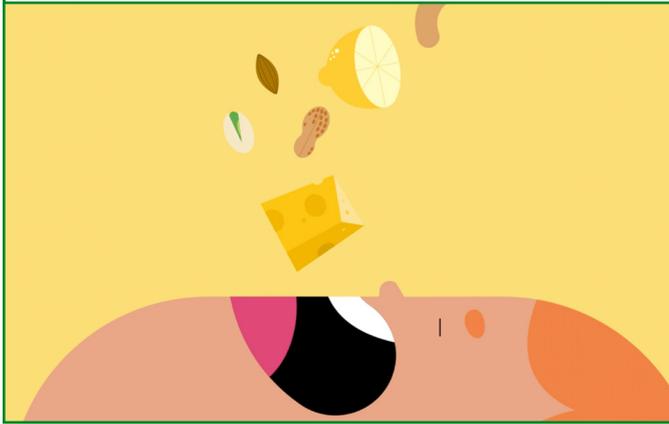
Location:

The classroom

Notes:

Scoping Out Senses

🎧 Listen to **Nomcast Series 4, special #3 Umami.**



✍ What Is a Sense?

- ❓ Ask students how many sense we have, and to name them. (Taste, smell, hearing, sight and touch are the traditional five.)
- ❓ Ask them to define what makes a 'sense'. (This is harder than it sounds – we tend to know what a sense is by our experience of it, not by a theoretical definition of what it is.)
- Provide this definition of a sense: 'A means by which the body perceives an external stimulus,' or this one from the Cambridge Dictionary of English: 'An ability to understand, recognise, value or react to something, especially any of the five physical abilities to see, hear, smell, taste, and feel.'
- A sense is a way that the human body can gather feedback about the world.
- Write this sentence on the board or read it out loud:
'I sensed that there was someone there in the darkness with me.'
or
'I sensed that something was wrong, and the hairs on the back of my neck lifted.'

- ❓ Students who love crime drama and gaming may have observations about which senses are most used in TV / movies and video game (sight and hearing).
- ❓ Ask what would be different if they were actually IN one of the tense scenes of a favourite fiction. If you like, discuss or watch a short clip of a tense scene from a common movie or game and discuss students' experiences.
- ❓ Ask student WHY we have senses. (To enable survival.)

Exploring Senses

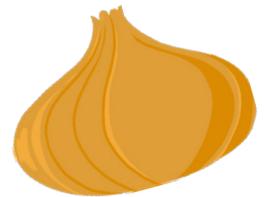
- ❓ Ask the class to close their eyes and tell them you are going to walk around the class with something. They need to use their senses to guess what it is.
 - Get out the container of cooked onion you prepared before the class. Hopefully it is still warm, even if slightly!
 - Take the lid off and walk around the room (students should have their eyes closed).
- ❓ When they guess what's in the container, ask them which senses they used – probably smell ... and maybe sight if someone snuck a glimpse!
- Explain how a sense works in the human body:
 - ◇ The brain gets signals from all parts of the body (eyes, ears, fingertips, etc.)
 - ◇ The brains sends signals to parts of the body to influence what they do. (Did anyone's mouth water or eyes prickle a bit when the smell of cooked onion hit the room?)
 - ◇ Cells in our bodies perform specific functions (such as nerve cells carrying information) and are arranged in body systems (such as the Circulatory system), or to communicate between systems (your mouth watering is a function of the Digestive system).

New Senses, New Science

- ❓ Ask students to extend one arm and point one finger (without hitting each other!)
- ❓ Ask them to close their eyes and touch their nose.
- ❓ Ask them to do it three times with their eyes closed. How many times did they miss?
- Watch this video, in which Philosopher, Barry C Smith from the University of London, explains the historical reasons why we still think we only have five senses – when neuroscientists would say humans have 22 or 23 senses (video, duration: 5:35): <https://youtu.be/zWdfpwCghlw>
- If students have never heard of the field of Philosophy of Science, explain that this video is an example of the questions Science Philosophers discuss.
- People in this field work alongside scientists of all types and are concerned with questions about assumptions we make and the foundations of science, the ethics of science and the methods, ethics and implications of the use of science.
- In the video, Dr. Smith mentions Neuroscience is the field exploring other human senses, including **Equilibrioception** (balance), **Proprioception** (knowing which parts of your body are where without looking – which is how we know where our noses are even with our eyes closed!)
- ❓ For an extra challenge, ask a volunteer to stand on one foot, close their eyes and touch their nose. It's hard!

Taste and Umami

- ❓ Ask how students knew you had onions in the container without tasting them?
 - By their sense of smell!
 - Explain that when we taste food the flavour we perceive is often also partly the smell that goes into our nasal passages and triggers scent receptors in the back of our throat and nose.
- ❓ Ask students where else we have taste receptors (it was in the Nomcast animation).
 - Your stomach, intestines, lungs and brain.
 - The taste receptors in these places perceive the 'shape' of molecules that correspond to what we call sweet, salty, sour, bitter and umami.
 - Umami was the most recently defined taste. The name refers to 'pleasant savoury taste' and is familiar from things like vegemite, cheese, tomatoes and sautéed onions.
 - So if we were to take the onions I cooked very simply before this lesson and layer that flavour with other great things ... like the spices for a curry or a slow-cooked Italian tomato sauce, the umami becomes rich and deep and very satisfying.
 - Traditional foods from all over the world often lay down these deep flavours through deliberate knowledge of how to build a base of umami (often with the onion family at the heart of umami), with sweet, sour, salty and bitter tastes on top.



✍ Research and Practice

- Working individually, students read two or more of the resources listed below.
- Students write or present a short report on changing views in science, and/or some of the implications these new discoveries may have for people whose senses are impaired for any reasons (e.g. deafness, either genetic or acquired).

Resources:

- ◇ Dana Foundation – Factsheets (a series of neuroscience info sheets including fact sheets on the senses): <https://dana.org/category/fact-sheets/>
- ◇ Dana Foundation – The Somatosensory System (explaining touch as a group of senses rather than one single sense): <https://dana.org/article/the-senses-the-somatosensory-system/>
- ◇ Sensory Trust UK – How many senses do we have? www.sensorytrust.org.uk/blog/how-many-senses-do-we-have
- ◇ Scientific American – How does the way food looks or its smell influence taste? www.scientificamerican.com/article/experts-how-does-sight-smell-affect-taste/
- ◇ Harold McGee interviewed about the science of how smells work (video, duration: 53:26): <https://youtu.be/WthjmAMo6LQ>
- ◇ Show notes for the above podcast with key takeaway concepts here: <https://podcastnotes.org/modern-wisdom/harold-mcgee-chris-williamson-smell/>
- ◇ Also see McGee, H. 2020, *Nose Dive: A Field Guide to the World's Smells*.

