

BREAKING IT DOWN

with Dr. Michelle Dickinson



THE HUMAN BRAIN

Welcome to Breaking It Down with Dr Michelle Dickinson.

This worksheet is to help you to support your teaching after your students have watched the 'Brain' episode. It contains a summary of the science knowledge, experiment instructions, topics for further inquiry, and links to the NZ curriculum at levels 3-4.

Use this sheet alongside the video for the Brain episode of "Breaking It Down with Dr Michelle Dickinson" to help with your teaching around the science of the human brain. During the episode, Dr Michelle Dickinson will cover the basic anatomy and biochemistry of brains, talk to brain expert Dr Malvinder Singh-Bains from Brain Research New Zealand and conduct an experiment which students can follow along with.

For this session, your students will each need:

- **Pencil**
- **Ruler**
- **Coloured pens/pencils**
- **Notebook to draw in and write down their observations**

NZ CURRICULUM STRAND: PHYSICAL WORLD

Achievement Aims

NZ Curriculum Strand: Living World

Life processes: Identify the key structural features and functions involved in the life processes of plants and animals.

NZ Curriculum Strand: Nature of Science

Understanding about science: identify ways in which scientists work together and provide evidence to support their ideas.

Communicating in science: begin to use a range of scientific symbols, conventions and vocabulary.

Learning Outcomes

- Understand the structure and function of the human brain.
- Understand the nervous system including the structure and function of nerve cells (neurons), and how our brains and nervous system interact.
- Carry out a simple experiment to demonstrate the brain's ability to recognise patterns in the environment, and how this can be used to "trick our brains."

BREAKING IT DOWN:

The Science of the Brain

Five main areas of the human brain which are discussed in this episode:

Cerebrum - This is the largest part of the brain, controls everyday movement and is divided into two hemispheres. The right hemisphere controls the left hand side of your body, and the left controls the right. A dominant hemisphere causes our "handedness."

Cerebellum - Located at the back of your brain, it's responsible for organising your muscles to work together to help you with balance and posture. Your cerebrum and cerebellum work together to carry out any movement involving muscles.

Brain Stem - At the base of your skull it meets the top of your neck and controls all of the things that happen without you thinking about them, like breathing, swallowing and your heart rate.

Pituitary gland - Only the size of a pea yet responsible for growth, making hormones and controlling things like puberty.

Hypothalamus - your body's thermostat, it monitors and adjusts your internal temperature as well as links your nervous and endocrine system.

The brain is constantly sending and receiving information from other parts of the body, via a network of neurons or 'nerve cells.' The structure of these nerve cells, with long thin axons (tails), help them to communicate efficiently by passing electrical pulses over long distances inside the body. For example, individual spinal neurons can be up to 1 m long.

Signals which are received often, or actions which are repeated often, create a fast neural pathway, so that we can do the action more efficiently the more times we repeat it. This is how we learn to ride a bike, write, or memorize information.

The brain releases 'neurochemicals' which relate to different emotions. Dopamine is released by the hypothalamus in response to things that provoke a feeling of happiness. Adrenaline is released when we feel scared or anxious. Both of these chemicals can result in a physical response like making our heart beat faster.

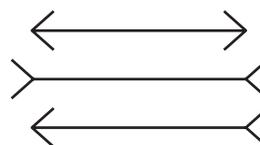
EXPERIMENT INSTRUCTIONS – Trick Your Brain!

Experiment 1

- Using coloured pens/pencils write down the name of a colour in a different colour to it's name for example: **GREEN** – **RED** – **ORANGE** – **RED** – **PURPLE** – **GREEN**
- First try to read the words in order as quickly as possible. This should be easy.
- Next try to read the colours that each word is written in as quickly as possible. You may find this more challenging.

Experiment 2

- Draw three lines the same length above each other and turn into arrows with different ends as shows below.



- Notice how your brain assumes the middle line is longer, even though you know they are all the same length. This is called the Müller-Lyer illusion.

EXPLORE FURTHER

(Use these prompts to start a discussion or further inquiry on the topic of the brain)

- How much does the brain weigh?
- Why do we dream?
- How fast can messages travel to our brain?
- Why is our brain so wrinkly?
- How much of our body's energy is used by our brain?

FURTHER EXPERIMENTS & INFORMATION



To explore further - and to connect your class with a practicing brain researcher - check out Brain Research New Zealand's fantastic online resource - beingbrainy.com



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If you have any questions, please contact info@nanogirls.com or check out Nanogirl's Lab – a new science adventure at home every weekday!