

Western Australian Virtual Education (WAVE) Project

Virtual reality (VR) alcohol and other drug project

At the beginning of the lesson, teachers should remind students that at the end of the lesson, there is an anonymous survey that students are to complete.

VR Lesson 1 – The brain and its functions

Teacher' script summary

Scene 1 – Introduction

You've been chosen to join an exciting exploration to learn about the amazing functions of the human brain.

There it is! The amazing brain! Your brain is the most complex organ in your body. Not only does it control basic life functions like breathing, organ function, and movement, but it's also behind more complex processes – everything from controlling our behaviours and emotions to problem-solving and creating memories.

Like our universe, our brain is made up of billions of parts. Let's have a closer look at some of the different areas of the brain.

Scene 2 – The Brain

There are 3 main areas of the human brain: the Cerebrum, the Cerebellum and the Brainstem.

The Cerebrum is the largest area of the brain and has a left and right hemisphere. It helps us to feel, see, hear and speak, as well as sense emotion, learn and move.

The outer part of the cerebrum is called the cerebral cortex. It is about 3mm thick and highly folded, so it has an enormous surface area - enough to cover a king-size bed!

The cerebral cortex is divided into four specialised areas called lobes. The cortex is where many of the complex functions of our brain happen, such as planning, organising, problem-solving, and developing our personality and intelligence.

Let's take a quick look at the lobes of the cortex and their functions.

Interaction: *Brain Puzzle – drag and drop interaction. The image of a brain is shown in front of the student. The narrator then asks the student to put together the parts of the brain as each lobe is explained.*

The occipital lobe processes information received from our eyes.

The frontal lobe is vital for many important functions, including regulating our emotions, planning, reasoning and problem-solving.

The parietal lobe processes sensory information it receives from the outside world, mainly relating to touch, taste, and temperature.

The temporal lobe processes sensory information and is very important for hearing, recognising language, and forming memories.

The cerebellum is located under the cerebrum. Its function is to control muscle movements maintain posture, and balance.

The brainstem connects the cerebrum and cerebellum to the spinal cord. This part of the brain forms first and is the first to fully develop, as it controls bodily functions necessary for life. It carries out automatic functions such as breathing, body temperature, wake and sleep cycles and digestion.

Underneath the cerebral cortex is the Limbic System. The Limbic system is involved in our behaviour and emotions. Especially those we need for survival, such as: feeding, reproduction, caring for our young, and fear responses.

Animation: *A gorilla walks in the direction of the students and jumps over them.*

The Limbic system is designed for speed. Think about this in terms of our fight-or-flight reaction. Uh oh...this can't be good...

A gorilla appearing in front of you is bound to give you a fright, which triggers a fight or flight reaction. When this happens, you either flee the threat or stay to fight the threat. We don't need to think about why or what we are doing - we just need to do something...and quick!

While all these different areas in our brain play individual roles, they all work as a team. The brain wouldn't work without communication between different areas. Let's explore this process more closely.

Activity [Knowledge check]

Question	The three main areas of the brain are:
Options	a) Cerebrum, cerebellum and brainstem b) Cerebrum, cortex and limbic system c) Left hemisphere and right hemisphere d) Frontal lobe, parietal lobe, temporal lobe, occipital lobe
Answer (Shown on screen)	Correct! The three main areas of the brain are the cerebrum, cerebellum and brainstem.
Feedback (Shown on screen)	If the student answers b), c) or d): Nice try! The correct answer is: a) The three main areas of the brain are the cerebrum, cerebellum and brainstem.

Question	The cerebral cortex is made up of highly folded grey matter that has a surface area large enough to cover a _____.
Options	a) Watermelon b) King-size bed c) Small car d) All of the above
Answer (Shown on screen)	Correct! The cerebral cortex is made up of highly folded grey matter that has a surface area large enough to cover a king-size bed.
Feedback (Shown on screen)	Nice try! The correct answer is: b) King-size bed. The cerebral cortex is made up of highly folded grey matter that has a surface area large enough to cover a king-size bed.

Scene 3 – Communication in the brain

Communication across the different areas of the brain is possible because of billions of tiny cells called neurons. Although, this neuron here is not so tiny.

All neurons send information to each other through a complex process, making connections that affect the way we think, learn, move, and behave. Neurons have several main parts.

Before you are some particles called neurotransmitters. These are the body's chemical messengers containing information that other neurons have sent to the neuron you see now. Different neurotransmitters carry different messages.

The neurotransmitters attach to branch-like structures called dendrites. The dendrites then send the message to the neuron's cell body via a nervous impulse.

The cell body processes the message before sending it to the neurons' axon.

Here, the nervous impulse arrives at the end of the neuron and causes the release of neurotransmitters, which move across the gap. The neurotransmitters then attach to another neuron, causing a nervous impulse. The same journey continues over and over until the message is delivered.

Scene 4 – Neurons in action

Let's watch the neurons in action when your body needs to complete a simple task. Pick up the drink bottle in front of you and lift it up to your mouth to take a sip!

Interaction: *Students are asked to pick the drink bottle and pretend to drink it.*

Mmm...refreshing! So, what had to happen in the brain for you to pick up the drink bottle? Let's unpack the process:

- The visual cortex recognises that you are seeing a drink bottle.
- The visual cortex sends signals to your frontal cortex, which decides that you are going to pick up the drink bottle.
- Your frontal cortex communicates with your motor cortex to plan how your hand will pick up the drink bottle.
- The motor cortex then calls on other parts of the brain, such as the cerebellum, which helps to activate the muscles. This involves sending information down your spinal cord, telling your muscles to pull on the bones of your arm and hand to grab the drink bottle.

Wow...who knew it was so complicated to pick up a drink bottle! The act of tasting a delicious drink causes your brain to release a reward chemical called Dopamine. Let's look a little closer at Dopamine.

Scene 5 - Dopamine

Dopamine is a neurotransmitter responsible for allowing you to feel pleasure, satisfaction and motivation. Feeling good after you have achieved something is because you have a surge of dopamine in your brain.

When we do things that help our survival, such as eating or exercising, our brain's natural reward system kicks into gear. Our brain recognises something feels good and rewards us by releasing feel-good chemicals like Dopamine. This makes us want to repeat the activity, which creates and strengthens a reward pathway in our brain.

Let's look at an example. Grab the delicious burger in front of you and take a bite.

Interaction: Students are asked to pick the burger and pretend to eat it.

When you eat your favourite meal, your brain recognises it tastes good and releases dopamine. This makes you want to eat the food again and again.

On the flip side, if you eat rotten food, your brain will recognise that it does not taste nice and might make you feel sick. Therefore, it does not release dopamine, telling your body not to eat the rotten food again.

Sometimes, however, the things that make us feel good aren't necessarily good for our health! For example, when we eat junk food, our brain tricks us into thinking it is okay to eat it by releasing a lot more dopamine than if we ate healthier foods.

The need to seek and repeat behaviours that make us feel good can be harmful if we use drugs and alcohol, which also trigger the release of massive amounts of dopamine. So, what part does dopamine play when it comes to drug and alcohol use?

Activity [Knowledge check]

Question	The three main parts of a neuron are:
Options	a) Dendrites, neurotransmitters, dopamine b) Nervous impulse, dendrites, branches c) Dendrites, cell body, axon d) Dendrites, stem, body
Answer (Shown on screen)	Correct! The three main parts of a neuron are dendrites, cell body and axon.
Feedback (Shown on screen)	<i>If the student answers b), c) or d):</i> Nice try! The correct answer is: a) Dendrites, neurotransmitters, dopamine. The three main parts of a neuron are dendrites, cell body and axon.

Question	When a person has a surge of dopamine in their brain, they are more likely to:
Options	a) Repeat a behaviour b) Stop a behaviour c) Be aggressive d) Feel sleepy
Answer (Shown on screen)	a) Correct! When a person has a surge of dopamine in their brain, they are more likely to repeat a behaviour.
Feedback (shown on screen)	<i>If the student answers b), c), d):</i> Nice try! The correct answer is: a) Repeat a behaviour. When a person has a surge of dopamine in their brain, they are more likely to repeat a behaviour.

Scene 6 – Dependency

Although our brains reinforce healthy behaviours, drugs and alcohol cause the release of massive amounts of dopamine, which can trick our brains to think that this is a healthy behaviour.

Our brains become trained to seek out the feelings produced by drugs and alcohol again and again, thinking that we need these substances to survive when, in fact, they are hurting us! Healthy behaviours struggle to compete with these feelings, so we can lose motivation for these healthy behaviours.

As drugs or alcohol are used more often, our reward pathway gets stronger and becomes our brain's number one strategy for feeling good. We can begin to seek out these substances without thinking about the consequences or other ways to feel good. People often refer to this as addiction.

So, why is drug or alcohol use harmful during adolescence? Let's find out.

Scene 7 - Myelination and Neural Pruning

During adolescence, a process called myelination and neural pruning is happening, which basically means that our brains are forming new, stronger connections and pruning away old connections that we don't use anymore. This makes our brains more efficient.

Using drugs or alcohol can change the brain's structure and reinforce these behaviours in place of healthier behaviours. This strengthens the drug or alcohol use connections, which can make these behaviours difficult to change, especially if they form during adolescence.

Just like the brain can change in a negative way with drug addiction, the brain can also change in a positive way when we adopt new skills and form new, healthier habits. Let's explore how this works.

Scene 8 - Neuroplasticity

It has been a commonly held belief that once we reach adulthood, our brains are not capable of dramatic change. However, recent research has identified that our brains are much more flexible and adaptable than first thought.

Neuroplasticity is the brain's ability to change and adapt both its structure and function in response to our experiences. This process helps us to learn new things, recover from brain injuries and strengthen areas of our brain.

Let's say that the red neural pathways in front of you relate to an unhealthy habit, such as eating unhealthy foods and that we are trying to develop a new habit – for example, making healthier food choices or exercising – represented by the blue neural pathways.

As we continue to use the neural pathways related to the new habit of eating healthier and exercising, they become stronger, and neural pathways related to our old habit of eating unhealthy junk food become weaker.

So now that we know our brains can change, what healthy behaviours do you have planned? Remember, if you don't use it, you lose it!

Activity [Knowledge check]

Question	A person's brain can change and adapt to their environment. This is known as:
Options	a) Neuroplasticity b) Neuronegativity c) Neuropositivity d) Neurochangeability
Answer (Shown on screen)	a) Correct! Neuroplasticity is the brain's ability to change and adapt to their environment. This is called Neuroplasticity.
Feedback (Shown on screen)	<i>If the student answers b), c) or d):</i> Nice try! The correct answer is: a) Neuroplasticity. Neuroplasticity is the brain's ability to change and adapt to their environment. This is called Neuroplasticity.

Question	Which of the following strategies could help reduce the risk of harm related to alcohol and other drug use?
Options	a) Avoid using drugs b) Adopt new healthy behaviours c) Ask for help from a trusted person d) All of the above
Answer (Shown on screen)	Correct! e) All of the above.
Feedback (Shown on screen)	<i>If the student answers a) b) or c):</i> Not quite! This is one strategy, but all strategies should be considered.

In-VR Survey

Choose the responses that most reflect your opinion.

I enjoyed this virtual reality lesson.

Strongly Disagree     Strongly Agree 

I would like more lessons in virtual reality.

Strongly Disagree     Strongly Agree 

I know more about the effects of alcohol and other drugs than I did before this lesson.

Strongly Disagree     Strongly Agree 

Doing the lesson in virtual reality made it easier for me to understand how alcohol and other drugs affect my body.

Strongly Disagree     Strongly Agree 

The information provided in this VR lesson has helped me to consider the impacts alcohol and other drug use can have on my body.

Strongly Disagree     Strongly Agree 

SUBMIT

When SUBMIT is clicked, 'Response submitted' appears.

End of the VR component of the Lesson 1.