Science Lesson Plan

This plan contains tailored activities for KS2 Science lessons. These are to be used as part of your curriculum as a way to improve students understanding of the effects of brain injury.

If your school has adopted us as your charity of the year or is having fundraising events to support The Children's Trust, then these activities can help students learn more about what they are fundraising for and how their efforts make a difference.

Lesson: KS2 Science

Lesson duration: 60 Minutes

Objectives:

- Students should have a basic understanding of brain injury and should be able to explain how it affects communication and cognition.
- Students should have grasped an understanding of the anatomy and function of the brain.

What you will need:

- A smart projector to present the diagrams to the whole class. Failing that print outs will be fine
- A 30cm ruler for the reaction time activity

Lesson Plan

Warm up: 5 min

Find a noun for each letter of the alphabet:

- This simple exercise gets both sides of your brain to work together.
- Get students to go through the alphabet and think of a noun (the more unusual the better) for each letter.
- The left part of the brain will help you to think of the word, and the right part will imagine what the noun looks like (colour, size, shape).
- This exercise gets the entire brain to focus and will get students mentally ready for the lesson.

Introduction to The Children's Trust: 10 min

- The Children's Trust is the UK's leading charity for children with brain injury and neurodisability. Our aim is to ensure that children and families affected by brain injury are able to live their best lives possible.

- Every year 40,000 children in the UK are left with a brain injury as a result of an accident or illness and it can be devastating – they may no longer be able to walk, talk, stand, sit, or feed themselves – sometimes all of these abilities.

- At The Children's Trust, we aim to help rebuild as many of their skills as possible, as well as their self-esteem. A child's confidence is central to that relearning.

- We help children do this through play, exploration, laughter and having fun; things that are often absent when a child has limited mobility or has had a challenging time. By combining music, singing, arts and crafts, day trips and other activities, with therapy, healthcare and education, children do not focus on what they cannot do, they just do it and have fun.

- The Children's Trust runs a range of specialist care, education and therapy services for children and young people from across the UK, including the UK's largest rehabilitation centre for children with acquired brain injury, which is based in Tadworth.

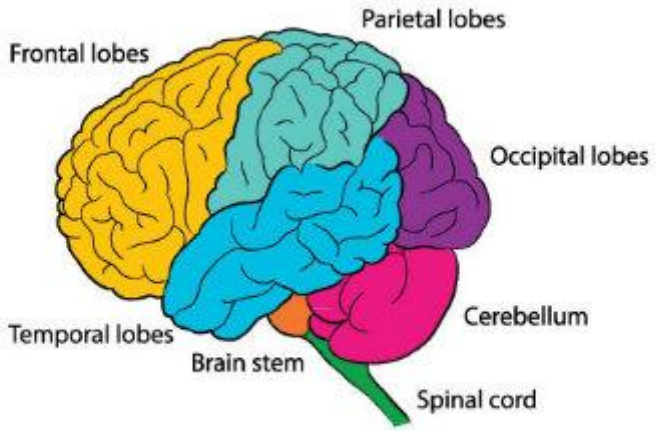
- Brain injury is a commonly misunderstood area and through our work and informational offerings like the brain injury hub, we are trying to better educate the public on the realities of life with brain injury and how cutting edge therapy and rehabilitation can change the life of a child.

If you need any further information, please visit https://www.braininjuryhub.co.uk/

Main activity 1: 15 min

The Brain:

- Use the diagram below to explain the different areas of the brain to students. Each section of the brain will be described and accompanied by a description of how that section is affected by brain injury. The activity leader should make the diagram visible to all the students and then begin to explain each section.



- **Frontal lobes:**

- The frontal lobes sit behind our forehead and are one of the biggest parts of the brain. The pre-frontal cortex, located here, looks after what are often called ‘executive functions’.
- As their name suggests, these are things like our judgement, decision-making, planning ahead, what we choose to focus our attention on, and the control of our behaviour and emotions. This sophisticated part of the brain ‘overrides’ and keeps in check our more basic impulses and behaviours. It also plays a large role in speech and language, and in memory.

- Within the pre-frontal cortex is the motor cortex. This is involved in the control of our planned movements (as opposed to involuntary ones).

- **When they are injured:**
- This part of the brain is particularly prone to injury if there’s an impact to the head. This is because the impact doesn’t necessarily have to strike this part of the head for it to be affected. Another reason this part of the brain is prone to difficulty is because it’s connected up to many other parts.

- If you look again at the important functions the frontal lobes are responsible for, you can get a good idea of how someone might be affected.

- A child may have more trouble making decisions, solving problems, doing things in a correct sequence (for example, getting dressed, getting ready for a lesson) or generating ideas.

- Behaviour can be affected. Some children show more impulsive behaviour – they may do things without ‘thinking them through’. For other children, the effect on their behaviour may seem the opposite. They may feel a loss of motivation or ‘drive’. Speech, language and memory are also affected.

- **Parietal lobes:**
- Found just behind the frontal lobes, the parietal lobes are the processing centre for a lot of the information that comes in from around the body. They help us with our perception and the way we make sense of the world. They contain the ‘primary sensory cortex’, which controls sensations, like touch, pain and whether something is hot or cold.

- **When they are injured:**
- When this part of the co-ordination system is injured, someone’s ability to locate parts of their body and their ability to know where they are in relation to everything around them is affected. This part of the brain is also involved in the way we understand language, and so this can be affected if the parietal lobes are injured.

- **Occipital lobes:**
- The occipital lobe is where we process all the visual information that’s pouring in. It helps us to perceive different shapes and colours, faces and objects.

- **When it’s injured:**
- Injury to this part of the brain can affect the way someone perceives size, shape and colour.

- **The Cerebellum:**

- Located at the very back of the brain, the cerebellum looks after our balance, movement and co-ordination. The cerebellum helps us with co-ordination and where we are in relation to everything else. It tells us which way is up and stops us from colliding into things as we make our way around. It looks after complex planning of movement.

- **When it's injured:**
- It can make children unsteady on their feet and less able to co-ordinate themselves when walking. They can have difficulties with their balance.

- **The brainstem:**
- The brainstem looks after what are often called our 'involuntary functions'. These are things we do that are crucial for keeping us alive, but they're things we do without thinking about it. It regulates our heart rate, our breathing, our blood pressure and our swallowing, all on 'autopilot' without a conscious thought from us. It keeps us alert, but it also keeps us calm. It also regulates our hormones.

- **When it's injured:**
- For some children, these 'involuntary functions' may no longer be on autopilot. In some cases, swallowing is no longer a reflex, and eating becomes difficult (and even impossible). In other cases, heart rate and breathing may not be as well regulated, which can cause difficulties. This part of the brain is important when we're talking about disorders of consciousness.

- **The Temporal lobes:**
- The temporal lobes are at the side of the brain at about the level of the ears. They process the sound that comes in from the ears, so we can understand and produce speech, and listen to music. The temporal lobes are also part of the wider system that looks after our memory.

- **When they are injured**
- Children might experience problems with language and communication.

Main activity 2: 20 min

- **Reaction time activity:**
- The final exercise in the lesson will focus on reaction speed and hand-eye coordination. After experiencing brain injury, many children suffer damage to their cognitive skills and develop significant reaction speed delays as a result. This means that they will not be able to make the connections between their aforementioned senses and the requisite actions as quick as they could before.
- Firstly ask the students to write down one example of a quick reaction in response to a stimulus for each sense.
- Give the example of slowing down on a bike when you see a person in the way.
- After 5 minutes, ask the class as a whole what they came up with. Get one example for each sense.
- The second part of the activity will require students to pair up and stand behind their desks. **You will need to provide each pair with one 30cm ruler for this task.**
- For this task, one member of the team will be 1 and the other 2. The students can decide this amongst their pair. Person 1 will hold out their hand with a gap between their thumb and first finger. Person 2 drops the ruler without telling Person 1 and they must catch it.

- Students can use the conversion table below to help convert your ruler measurements into reaction time or just record the catch distance in cm.

Distance	Time
1 cm	50 ms
5 cm	90 ms
10 cm	140 ms
15 cm	170 ms
20 cm	200 ms
25 cm	230 ms

Once each student has completed the first attempt, you can start introducing incremental changes, which are designed to slow the reaction speed of the individual.

Here are a few good examples:

- Students must place their hands behind their backs before the ruler is dropped
- Students are told when the ruler is going to be dropped but are facing with their back to the ruler to start off with
- Students have to close their eyes before the ruler is dropped

After 10 minutes of students have trying and recording these variations, ask them to sit back down at their desk and ask them how their reaction time differed from the start of the task to the end of the task.

The aim of this activity is to demonstrate how we take our quick reaction times for granted and how quickly connections happen across the five senses. You should highlight the fact that brain injury affects the brain's ability to make many of these connects quickly or at all. However, cognitive and physical rehabilitation at The Children's Trust can help children rediscover these lost connections.

Outcomes

By the end of the lesson, the students should have developed an understanding of how an ABI changes the lives of children and their ability to undertake cognitive tasks. The students should be able to explain why the tasks they undertook were different and more difficult than usual. They should also be able to explain how The Children's Trust helps improve the lives of those children with ABI.