**Medics in Primary Schools 2022**

**Healthy Brain**

**Please discuss this guidance material with your class teacher before starting this unit, particularly in relation to practical activities, and act on her / his advice.**

The Northern Ireland Curriculum, introduced in 2007, is clearly related to the processes of thinking and learning. See <http://ccea.org.uk>, follow Key Stage 1&2, then Curriculum and (Read more) Personal Development and Mutual Understanding (PD&MU). See also the curriculum Big Picture (in Useful Links). While teachers will have developed pupils’ thinking and learning capabilities, it is unlikely that they will have covered the science of the brain in detail.

Some basic ideas about the brain are listed in this unit, with a series of questions for development. It should be emphasised that, in the science of perception and the brain at this level, children are expected to understand what is happening inside their heads, so that they can improve their thinking and learning – but they are not expected to remember anatomical terms or reproduce information or diagrams. It should also be emphasised that much of the information to be provided here is simplified and may be studied in more detail in Key Stage 3 and later. Note that the language used in this Guide is aimed at you as an adult. Ask your class teacher to help you simplify it for pupils.

While this unit is dedicated to perception and the thinking and learning aspects of the brain, it avoids discussing mental health as this should be covered in the school’s own programme within Personal Development and Mutual Understanding.

**Week 1**

**1. How do I learn about the outside world?**

*Pupils should learn that we get information from the world around us through our senses:*

*- seeing: what, where, how far, how close up, magnified, one or many, large or small?*

*- hearing: range of sounds, loudness, pitch or frequency*

*- tasting: bitter, salty, sour, sweet, savoury*

*- smelling: nice, nasty*

*- touching: temperature, texture, hardness, pain, pleasure*

**Activity – The world around us**

Ask pupils how we find out about the world around us. This can start from the questions:

- How do we know what is outside of us?

- What are our senses? Where are they located in our bodies?

- What sort of information do our senses provide?

- How do our senses connect with our brains?

Encourage pupils to ask you questions. Develop the idea of perception. We also find out about the world around us by talking with people, reading books and sensibly using television and the internet. See <http://en.wikipedia.org/wiki/Sense> for background information.

**Activity – Finding out about the world around us**

1. Divide the class into five groups. Ask each group to discuss one of the following questions: What can I find out about the world around us by touching / seeing / smelling / hearing / tasting? How can I do this?

2. Then ask a representative from each group to report to the whole class.

**Activity – Keep still**

Perception, using our senses, is the first step towards making sense of the world around us.

- Ask pupils to sit still for one minute and, individually, to record all the sounds they hear during this time. Ask them to listen more carefully for quiet sounds. Notice the range of sounds in the environment.

- Record the sounds on the board. Ask pupils to classify these. Discuss what criteria we can use for classifying (possibly natural, human or mechanical sources, loud or soft, high or low pitch).

- Are there sounds we don't notice in everyday life? Senses have ranges of sensitivity. Ask how we might increase our sound sensitivity.

**Activity – See better**

Ask pupils to look in front of them, and out through the window, and record all the things they see during one minute. Ask how we might increase our ability to see small things, leading to the idea of using magnifying glasses and microscopes, and to see far away things using telescopes or binoculars. Emphasise the idea that our senses can be enhanced through the appropriate technology. Develop ideas on the physical processes of seeing. Try and get as much information as possible through questioning the pupils. A possible sequence might be:

- structure of the eye

- function of the parts of the eye

- what can go wrong with each of these parts

- what can be done if something goes wrong

- how the operation of the eye be improved

For detail enter ‘eye structure diagram’ in an internet search box

**Activity – Pinhole camera**

*\*You may need to ask pupils or the school to collect empty Pringles or similar containers in advance for this activity.*

You can show how an image of the world around us can be projected onto the retina using a pinhole camera made from a Pringles container

(see [www.exploratorium.edu/science\_explorer/pringles\_pinhole.html](http://www.exploratorium.edu/science_explorer/pringles_pinhole.html), or search ‘pinhole camera’ for instructions). Cut the tube so that the longer (camera) piece is 20 centimetres. The image is faint: ask how this can be improved. Making the pinhole larger results in a brighter image, but poorer focus, leading the idea of using a lens. Our eye is obviously more complex, and the use of a lens increases the amount of light that can be gathered, and enables sharper focus.

\*If you have access to a +5 dioptre lens, place this lens in the enlarged pinhole of the 20 cm tube.

Wikipedia provides a useful article on optical illusions (<http://en.wikipedia.org/wiki/Optical_illusions>). You might use some of these on an interactive whiteboard.

While this section has concentrated on the senses of seeing and hearing, discuss the idea that we and other animals also get a lot of information about the world around us through smelling, tasting and touching. Blind people can read through Braille, using their sense of touch. Many animals use their sense of smell much more than we do, and dogs can be trained to smell out illegal drugs and detect specific diseases. You can find further information and activities on:

**Neuroscience for Kids** <http://faculty.washington.edu/chudler/chsense.html>.

###### Week 2

**2. What does my brain do for me?**

*Pupils should learn that the brain (inside our head) is the part of our body that*

*- converts sense inputs into useful information*

*- instructs our muscles (including our voice and eye muscles)*

Start from where the children are, with questions:

- What enables us to process the information we get from our senses?

- How do we respond to what’s happening outside of us?

- What enables us to do things?

**Activity – Brain in action**

Find out what pupils already know about their brains. Ask them first in pairs, then in small groups to list as many things they do at school or at home that they can think of in two minutes. For example, clean their teeth in the morning, look and listen before crossing the road. Assemble a class list of about ten activities. After they present their responses, link their activities with senses and explain that these senses are related to brain structures.

The brain structure cannot be deduced by pupils, but might come from an internet / library search exercise, leading to a simplified diagram.

- the *brainstem* is an extension of the spinal cord at the base of our brain. This controls automatic actions like breathing and heartbeat, and is responsible for instinctive reactions like a flight or fight response when faced by danger.

- the *cerebellum,* behind the brainstem, controls our movement and coordination. It has sensors that help us maintain balance, and coordinates multiple muscle groups including those controlling eye movements.

- the *limbic system* is a collection of small almost duplicate structures near the centre of our brain, mainly responsible for learning and memory, and for our emotional development.

- the *cerebral cortex,* the outer layers of brain tissue, controls our conscious thoughts and enables us to communicate with people and objects in the world around us. This communication process operates through three main functions: sensory (obtaining information), motor (using information) and association (linking information) in areas which are dispersed throughout the cortex rather than in single blocks.

Note that pupils are not expected to remember the names of parts of the brain. Emphasise that this division is a simplification, but this may be developed at secondary school. Because of the complexity of the brain, other analyses are available.

**Activity – Use your fist**

Pupils can make a very simple model of the brain with their hands. Ask them make a fist with their left hand. The wrist represents the brain stem and the base of the thumb is the cerebellum. Their closed fingers represent the limbic system. Now ask them to place their right hand over the top of their fist to cover it: this represents the cortex or cerebrum.

A picture containing text, athletic game

Description automatically generated

Explain to pupils that parts of their brain are connected by nerves called neurons, like an electric circuit. Each of us has nearly a hundred thousand million (1011) of these, and they may each make thousands of connections to other neurons in our brain. Emphasise that, while neuroscientists are learning a lot about our brains, there is even more that we don’t know. But the more we know about how our brain works, the more effectively we can use it to think and learn.

You may find the following websites useful for more detail:

- <https://serendipstudio.org/bb/kinser/Structure1.html> for brain components and their functions.

- [www.wartgames.com/themes/humanbody/bodyparts.html](http://www.wartgames.com/themes/humanbody/bodyparts.html) for a selection of brain, ear and eye games. This website also includes information and games on the heart.

- [www.optics4kids.org](http://www.optics4kids.org) for optical aspects of the brain.

**3. How can I learn from the outside world?**

*Pupils should learn that we learn through our interaction with the environment.*

When we meet a new experience or a problem in the environment, we either:

- change the environment around us (for example, open a door so that we can go through it, or organise a group to clear up litter on a local beach), or

- change ourselves, the neuron connection structure in our brain (know not to touch a hot kettle next time).

According to Jean Piaget ([www.simplypsychology.org/piaget.html](http://www.simplypsychology.org/piaget.html) and associated websites), we either adapt the world around us to suit ourselves, or we accommodate ourselves to the world. This is the process of learning, and so we learn from experience.

This is common sense, and should be developed from questioning the pupils about their experiences in learning: How did you learn to play football, cook a meal, about energy ...? Introduce *neurons* simply without detail as the electrical connections in the brain and spinal cord – like a computer (though emphasise that the human brain can do far more than the fastest computer).

**Activity – The best place to learn**

Discuss conditions for effective learning: challenging (but not stressful) environment, effective light and colour, temperature and humidity, adequate food and drink, stimulus through the senses. What would be an ideal place to learn? Ask pupils either individually or in small groups to draw a picture or diagram of their ideal learning environment.

This may lead into the idea of learning styles (aural, visual, kinaesthetic – though not using these terms: hearing, seeing and feeling / doing may be more appropriate at this level). Show that a balance of all styles is good, because it will be important for children to learn through all their senses as they grow up. Emphasise that people are different: there is no general 'best' way, but there may be a best way for you or me. Also show that different people have different capabilities (music, sport, mathematics, language, for example). You can find further information on: <http://en.wikipedia.org/wiki/Multiple_intelligences>. Some people advocate using the term *multiple capabilities* rather than *multiple intelligences* as these skills don’t fall within the generally accepted definitions of intelligence.

Show the need for a variety of learning experiences using all the senses, that allows development of both the strength and the breadth of hearing, seeing and feeling / doing learning, because breadth will be needed in the future real world: “I learn best by working with my hands, but I'm also improving my ability to learn by seeing and listening”. Get them to accept that we don’t know what the real world will be like in 20, 30, 40, 50 years’ time, so we need to learn by as widely varied methods as possible now.

Ask what can go wrong with our brain (examples: injury, epilepsy, dementia, etc). \*Be sensitive here: ask for and accept your class teacher’s direction regarding any pupil with a brain impairment, or may have a brain impaired relation or friend.

Injured people may learn to walk and move again, and you can learn to write with your ‘other’ hand if your ‘working’ arm is in plaster. But this is not yet the case if the spinal cord is severed – though research is leading in the direction of making this possible. This leads to the idea of sensory-motor structures, and how these pathways serve electrochemical signals that may stimulate regeneration. You might mention that research is being done to help restore connections between the brain and limbs of people with paralysing spinal injuries (see [www.spinal-research.org](http://www.spinal-research.org) for information).

Tell the story of Phineas Gage as an introduction to the idea that we learn a lot about how the brain works from how it doesn’t work properly when it’s damaged. (See [www.bbc.co.uk/news/health-12649555](http://www.bbc.co.uk/news/health-12649555), and use a search engine for further information about Phineas)

\*Play some mind games to indicate the complexity of the human brain: use a search engine for ‘mind games’. Check these in advance for appropriateness.

###### Week 3

**4. How can I improve my memory and learning?**

*Pupils should learn that reinforcing neuron connections develops memory and learning.*

What things do I need to remember?

**Activity – Effective learning**

\*Ask your class teacher about a topic (not necessarily science) that the pupils have covered recently in class.

1. Write the title of the topic on the board. Ask each pupil to write down two important points about the topic.

2. Ask them to share their ideas in pairs, then small groups.

3. Provide each group with a sheet of A1 (flipchart) paper, or use Activity Sheet A5: *Group Discussion*. Ask groups to organise their material into a map / spray diagram, or other means of presentation, so that they can remember it easily. They have to think about clustering material, connecting it to other material, using mnemonics, and presenting it so that others can understand it. See <http://systems.open.ac.uk/materials/T552>. Click on Spray diagrams (top left). However, appreciate that some pupils may prefer to learn through words rather than pictures.

**Activity – Types of memory**

Ask pupils to investigate different types of memory, from:

- short-term or working,

- episodic memory of experiences and events,

- semantic memory of facts and ideas,

- procedural (unconscious) memory for learned skills

1. Divide the class into four groups. Ask each group to find out about one of these four types of memory, and produce a 50 word report on each.

2. Then ask a representative from each group to report to the whole class.

Pupils need to get the ideas, rather than remember the names. Some emphasis on the importance of different ways of reinforcement of neuron connections in memory (which can be different for different people), for example: mnemonics, continued practice. You can find further information on: <http://en.wikipedia.org/wiki/Memory> and [www.human-memory.net/types.html](http://www.human-memory.net/types.html).

**Activity – On the other hand**

Practice helps you to learn new things and to get better at doing them. Ask pupils to write their name with the hand they don’t normally use. Repeat this continually for about two minutes. Now compare the final attempt with the first. Which is better?

Not reinforcing memory causes withering of the neuron connections (for example, reducing our ability to learn a second language after the age of two or three). On the basis of what pupils have learned about how memories are stored in the brain, develop means of improving memory: structuring the information, teaching others.

How well you learn depends on learning actively rather than passively. We can learn some things by just listening to someone talk or passive reading. We learn more by seeing as well, as in reading actively (asking, after you read each paragraph, ‘what was that paragraph all about?’) or using audio-visual material. It helps even more if we see a demonstration or take part in discussion about what we have heard and seen. Probably the most effective way of learning for ourselves is to teach what we have learned to other people. The more the neuron connections in our brain are reinforced the more effectively we learn.

**Increasing Learning**

**Actively using learning**

**Teaching others**

**Practice by doing**

**Discussion group**

**Demonstration**

**Audio-visual**

**Reading**

**Lecture / listening**

This information is summarized in the box opposite. You may find the Activity Sheet T1: *Increasing learning* useful here.

**5. How can I look after my brain?**

*Pupils should learn how to look after physical aspects of their brains.*

There’s useful information on mental health on the site: [www.mindingyourhead.info](http://www.mindingyourhead.info). Note that this website is aimed at adults rather than children. \*Check with your teacher what mental health material is used in your school, and if it is appropriate to proceed with this section.

Ask the children for answers to the question: How can I look after my brain? Then group ideas, possibly including:

- Protect it: wear a cycle helmet and sports protection. Know that fire kills by suffocation more often than burning (so oxygen doesn’t get to the brain). Learn to swim.

- Have a broad, balanced diet. Identify diet fads and fashions. Emphasise the importance of factual research-based knowledge on this area.

- Take appropriate body and brain exercise: ensure effective breathing and blood circulation to carry oxygen to your brain. Do thinking exercises in puzzles and games.

- Have enough sleep and rest, for recovery. But – there are many things that we don’t understand about the brain and sleep.

**6. What rules can I use to help me develop a healthy mind?**

*Pupils should learn how to look after mental aspects of their brains, and*

*- develop rules for healthy minds in themselves*

*- develop rules for healthy relationships with other people.*

Resources from the Northern Ireland Curriculum PD&MU (Personal Development and Mutual Understanding) Year 7 *Living. Learning, Together,* Unit 2: *Thinking and Feeling* may be useful in this section. See [Year 7 | CCEA](https://ccea.org.uk/learning-resources/living-learning-together/year-7) Follow Unit 2. \*Please discuss this with your class teacher, and check if pupils have covered this unit.

Split the class into two groups. Let one group do *Activity T2 – My healthy mind***,** and the other group do*Activity T3 – Relating to other people.*

**Activity – My healthy mind**

Ask the class to develop ten rules for a healthy mind related to themselves as individuals.

1. Ask each pupil to write down two or three rules. You might suggest one or two from the list below as examples.

2. Ask them to share their ideas in pairs, then small groups, to identify five or six important rules.

3. Then ask the whole class to organise their material into a list of ten to twelve agreed rules

Some possible responses to these activities are included below. There are others which pupils may propose (and the class agree). You may find Activity Sheet T2: *Rules for a healthy mind* useful here.

**To develop a healthy mind, I should:**

- understand the difference between right and wrong

- understand that I have rights – and responsibilities

- experience a range of feelings, and express these sensitively

- know that I am a worthwhile person

- know that I am different from everbody else

- identify what I can do well, and what I want to improve

- exercise both my mind and body

- set aims and achieve them, but get over it when things go wrong

- learn from my mistakes

- expect to be able to do things, and then get on with the job

- realise that I am changing as I grow up

- be creative: do something creative every day

- be able to enjoy myself

- be able to do things on my own, or in cooperation with other people

**Activity – Relating to other people**

Ask the class to develop ten rules for a healthy mind related to their relationships with other people.

1. Ask each pupil to write down two or three rules.

2. Ask them to share their ideas in pairs, then small groups, to identify five or six important rules.

3. Then ask the whole class to organise their material into a list of ten to twelve agreed rules

Some possible responses to these activities are included below. There are others. You may find Activity Sheet T3: *Rules for healthy relationships* useful here.

**To develop a healthy relationship with others, I should:**

- express my feelings sensitively

- accept that other people are different, and may express their feelings differently

- make promises, and then keep them

- assert myself without being unpleasant: recognise other people’s points of view

- have good relations with my family, friends and other people.

- make time for my family, friends and other people

- share problems with my family, friends and other people

- accept and give thanks, congratulations and apologies when appropriate

- accept support from, and give support to my family, friends and other people

- get involved in something that makes me work or play with people outside my family

Present both final lists to pupils in both groups.

**Extension Topic – Mental well-being**

The covid-19 pandemic has caused a major disruption in young people’s lives, from school to daily routines.  This can have a detrimental effects on mental health, for example stress, anxiety and mental exhaustion.  Talk to them about strategies they can use to take care of themselves, for example:

1. Foster healthy relationships

2. Learn Stress Management

3. Establish Healthy Habits

4. Play Together

**Extension activity – Tackling global warming**

The 26th UN Climate Change Conference took place in Glasgow during 31 October – 12 November 2021. Explain to pupils the background to the conference. See https//ukcop26.org

1. Ask pupils in pairs to write down one thing that might be done to alleviate global warming by each of (i) pupils as individuals, (ii) local government / local councils, (iii) the Northern Ireland Assembly / Executive, (iv) National (Westminster) government, (v) international organisations like the United Nations.

2. Ask them to share their ideas in groups of about five to identify 2 or 3 important actions in each of these areas.

3. Then ask the whole class to organise their material into a list of agreed rules.

You might suggest (if your teacher agrees) that the class should send the outcome of your activity to a local councillor one of your local MLAs. You can find their email addresses on

(Councillors) [www.gov.uk/find-your-local-councillors](http://www.gov.uk/find-your-local-councillors) Follow the link to your local council.

(MLAs) <http://aims.niassembly.gov.uk/>

**Extension Activity** **– Waste Management**

Brief the pupils about the concept of Reduce, Reuse and Recycle with examples:

1. **Reduce** means reduction of use of paper or other sources of potential waste. If we reduce unnecessary use, wastage will also be reduced.

2. **Reuse** means, for example, using of one side printed paper for rough work, or similar examples. By reusing material like this, we can reduce waste generation.

3. **Recycling** means processing of waste to produce useful new materials / items. This is achieved through several stages and requires a lot of money and time. The other two methods are the most effective ways of reducing waste / pollution.

**Developing cross-curricular skills in *Healthy Brain***

**Communication:**

**-** using scientificwords and phrases related to the units, for example, brain stem, cerebellum, limbic system

- making posters to illustrate, for example, to show the simple structure of the brain

- reporting on what they have learned, using a range of media including paper, electronic, verbal class presentations

**Using ICT:**

- word processing and presentation of information,

- accessing information on websites, and choosing appropriate material

**Notes**