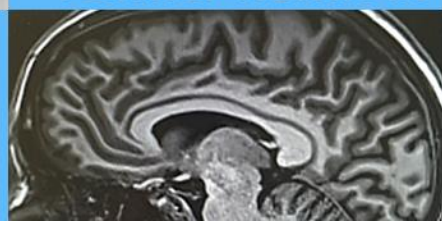
MIE BRAIN

Teacher Handout

BUILD YOUR BRAIN

Module 4: Brain Health and Meta Learning

Session: How brain health impacts learning



LEARNING OUTCOMES

1. Learn how stress and anxiety affects and disrupts our brain's network and our ability to learn. 2. Learn how the structure of our brain's network – graph features – are important for resilience and mental wellbeing as well as effective learning. 3. Build resilience into our mathematical model of the mind's network and how this represents our brains ability to constantly adapt and learn (neuroplasticity). 4. Revisit and modify your previous design of your brain region, building on what we have learnt about resilience and neuroplasticity, to better communicate and learn.

SESSION OVERVIEW

In this 90-minute session students will learn about how stress and anxiety change our brain network's structure and function in the short and long term. We will see how stress changes the way our brain network sends and receives messages and how this can lead to negative neuroplasticity, drawing in examples from research. We will then see the importance of resilience in our network to protect against poor mental health and promote wellbeing. We will then revisit graph theory to investigate and build a brain network that is resilient and learns. Students will then be asked to work in their groups from session 1, on their specific regions. Taking what they have learnt from this session about stress, resilience and learning to improve their design from last time. This will form the basis of the Build Your Brain Module. This teacher handout is to be used alongside the **data collection sheets** and the PowerPoint presentation provided in this module.

BYB_04_Brain_Health_and_Meta_Learning.ppt

ATTRIBUTES

The attributes we will acquire by the end of this session are, Exploring, Logic, Creating, Experimenting, Problem Solving, Persevering and Collaboration.

Exploring
Inquiring to learn new things

Logic
Making predictions and analysing things

Creating
Designing and building from ideas

Experimenting
Changing things to see what happens

Persevering
Finding new approaches to keep going

Collaborating
Sharing ideas and working with others

Problem solving
Finding errors and fixing things

MIE LAB School Senior
MAKE INTEGRATE EXPLORE

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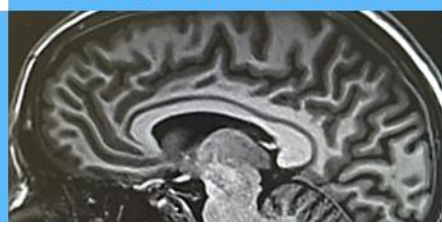


Equipment

- Data collection sheets 1, 2 and 5
- Brain region print outs
- Coloured headbands
- Two balls of yarn
- Messages printout
- Spare pieces of paper for group drawings and designs

Preparation

Introduction to task: This 90-minute session is broken down into 30-minute recap and introduction to stress and meta learning, a 30-minute practical session to build a network. Then a 10-minute design period for students to develop their brain region in their groups. Followed by a 15-minute presentation section and a 5-minute reflection period to consolidate what they have learnt.

SESSION

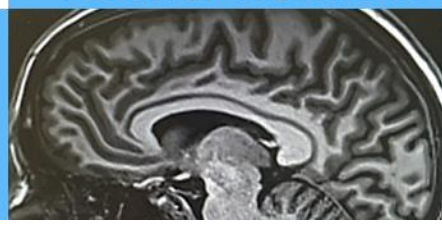
1. RECAP THE LESSONS FROM LAST SESSION

In the first 5 minutes of this session we are going to run through the first 5 slides of the PowerPoint presentation recapping what we learnt from last time. Depending on the time between each session you may wish to skip this section.

Slides 1-2: These slides introduce the topic of this session, the learning objectives and attributes that we will be building on by carrying out this session. Together these attributes form the fundamental skills needed to carry out STEM. These attributes will appear in the corner of the slides as we move through the session to signify what scientific skillset we are using at any particular time.

Slide 3: This slide gives the students an overview of the session, what they will be asked to achieve and how they will achieve this. Run through each text block in turn. Some students may feel apprehensive about the drawing element to this module but it is not about drawing ability it is about using drawing as a tool to learn and develop ideas.

Slide 4: This slide recap the import take home messages from the last session – the executive functions, that the brain can be separated into regions that work together in a network to carry out these executive functions, how our brain network calls on different



regions to learn we learn and how learning changes the structure of our network. We will be studying this network further to understand how stress can impact the way we learn.

2. INTRODUCTION TO BRAIN HEALTH AND IMPACT ON META LEARNING

These next 10 slides introduce the topic of this session, how stress impacts our brain's network and how we learn new things.

Slide 6: This slide sets the scene for this lesson. Ask the students to imagine that they have to revise for an exam and have left it all to the last minute. We are now going to see how our brain's network functions under stress and how this impacts our ability to remember and recall information. The students will need to follow along filling out *Data Collection Sheet 5* as we go.

Slides 7-12: These slides step through what happens in our brain as we try and learn under a stressful situation. Step through the slides one by one talking to the bullet points and asking the students to draw the activated network as we go. The executive function wheel indicates which executive functions we are using at what stage in the story. The slides have been designed so that all the information is on them. You don't need to be an expert to present this information but it is important to note that this is a very simplified model of what occurs in our brain and we are still learning all the time how our brain functions.

Slide 14: This slide shows an example from research. This study looked at the brain network in healthy people and people with social anxiety disorder (SAD). SAD had higher functional connectivity between the frontal lobe and emotional processing center as well as other regions of the brain. SAD participants had a shift in the brain network towards a randomized network, the network that we covered last time.

Slide 15: This slide introduces the idea that we need both features from the regular and random network to build resilience as well as efficiency into our network. This type of network is known as a small-world network.

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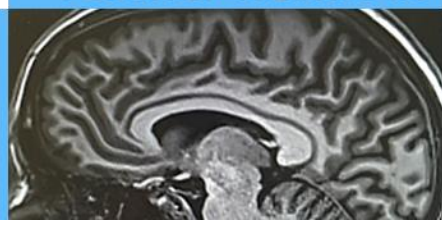

3. BUILDING OUR SMALL-WORLD BRAIN NETWORK

Slide 17: In this practical session students put what we have learnt about learning into practice and build their own small-world brain network to learn a new skill. Here we lay out what we will need.

Slides 18-19: Follow the instructions and organize the class in a circle. Split the circle into four quadrants with the tape on the floor and place the four lobe name cards. 1: visual cortex 2: frontal lobe 3: motor cortex 4: memory center in each quadrant. Number each person 1 to n in each quadrant and pass out the coloured hats so each quadrant is a different colour. Before they start exchanging messages you will have to choose 4 people, 1 from each quadrant and all different numbers to step out of our brain's network, away from the circle. Then follow the rest of the instructions on how to pass the messages between the lobes.

Slide 20: The students will quickly find that they cannot pass the messages between them. This is analogous to what happens in a diseased or injured brain. Connections get disrupted and cannot communicate information effectively. Allow the students to discuss this.

Slide 21: Now we are going to try again and build our small-world network that takes graph properties from both the regular and random network. This is the network that our brain forms. We need both efficiency and redundancy to cope with disease and aging. resilience – plasticity. The way to build your defense against stress is to have a brain network that has lots of options in pathways! Both long and short connections. This type of network is called a small world network.

Slide 22: This slide shows us that most effective networks are versions of small world networks. It's not just our brain, social networks and transport networks follow these rules so as to work efficiently and be able to cope with failures or disruptions in connections.

Slide 23: This slide gives examples of things we can do to build resilience into our network.

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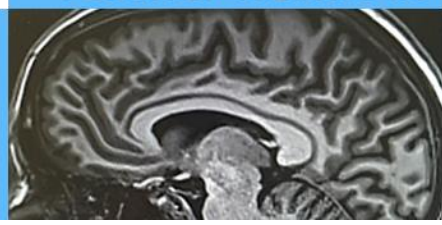

4. BUILDING YOUR BRAIN

Slides 24-25: Now we are going to build on the previous design working on *Data collection sheet 2*. Get the students back in their groups from last time and ask them to think about what they have learnt in this session and how they would improve on their design. This is the last time they will build on their brain region before the Build Your Brain Art Day. Make sure they hand their work in at the end of the lesson as they will need to refer to their designs on the art build session.

Slide 26: Now give them 10 minutes to build on their previous region design, working on *Data Collection Sheet 2*, to now build in resilience. They can also refer back to their symbols/icons on *Data Collection Sheet 1* from the previous session and a handout of the slide relating to their region as a prompt. We have provided an example to give them some inspiration.

Slide 27: Now ask a few groups to present and explain their initial design/idea to the class. This will consolidate what they have learnt. Ask the students to hand in their designs ready for the build Your Brain Art Day next time and then wrap up the session by asking them to name 3 things they have learnt from this session, adding to the table provided at the bottom of *Data collection sheet 2*. encourage them to come up and write it on the board.

Year 9 – Brain Health and Meta Learning			
Lesson number	**Focus**	**Australian Curriculum and General Capabilities**	**Australian Curriculum Content Descriptors**
BYB 04	Brain Health and Meta Learning	• **Critical and Creative Thinking** – Identify and clarify information and ideas • **Critical and Creative Thinking** – seek solutions and put ideas into action • **Critical and Creative Thinking** – Apply logic and reasoning • **Critical and Creative Thinking** – Evaluate procedures and outcomes • **Critical and Creative Thinking** – Reflect on processes • **Critical and Creative Thinking** – Organise and process information • **Personal and social capability –** Make decisions • **Personal and social capability –** Develop reflective practices • **Personal and social capability –** Work independently and show initiative • **Word knowledge –** Understand learning area vocabulary	**Health and Physical Education** – Personal, social and community health: Evaluate situations and propose appropriate emotional responses and then reflect on possible outcomes of different responses (ACPPS094 - Scootle) **Health and Physical Education** – Personal, social and community health: Critically analyse and apply health information from a range of sources to health decisions and situations (ACPPS095 - Scootle) **Visual Arts** – Understanding how visual arts works: Develop and refine techniques and processes to represent ideas and subject matter (ACAVAM127 - Scootle) **Visual Arts** – Understanding how visual arts works: Manipulate materials, techniques, technologies and processes to develop and represent their own artistic intentions (ACAVAM126 - Scootle)
	Focus	**Learning outcomes**	**Resources**
	Brain Health and Meta Learning	• Learn how stress and anxiety affects and disrupts our brain's network and our ability to learn. • Learn how the structure of our brain's network – graph features – are important for resilience and mental wellbeing as well as effective learning.	BuildYourBrain_04_Brain_Health_and_Meta_Learning - Teacher handout BuildYourBrain_04_Brain_Health_and_Meta_Learning.ppt Data collection sheet word documents 1, 2 and 5

		• Build resilience into our mathematical model of the mind's network and how this represents our brains ability to constantly adapt and learn (neuroplasticity). • Revisit and modify your previous design of your brain region, building on what we have learnt about resilience and neuroplasticity, to better communicate and learn.	