MindSET-do

Brain Health and Wellbeing 70mins Lesson 2

Learning Intentions	Lesson Outcomes
• Students understand the concept of the brain as a network • Students investigate and discuss how mathematics can be used to map how the brain communicates • Students investigate terminology and the properties of graphs in the mathematical branch known as graph theory. • Students learn how researchers mathematically compare different brain disorders. • Students reflect on and discuss a brain region design	• Knowledge of how the different regions in our brain work together to form our mind's network. • Discuss and carry out basic implementation of the branch of mathematics that neuroscientists use to study the minds network - graph theory. • Understand how we mathematically distinguish between a healthy and disease brain network. • Work collaboratively to complete the design of a brain region and present it to the class.

Australian Curriculum Content Descriptors	Australian Curriculum General Capabilities
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) **Visual Arts** • Understanding how visual arts works: Develop and refine techniques and processes to represent ideas and subject matter (ACAVAM127) • Manipulate materials, techniques, technologies, and processes to develop and represent their own artistic intentions (ACAVAM126) **Design Technologies** • Develop, modify and communicate design ideas by applying design thinking, creativity, innovation, and enterprise skills of increasing sophistication (ACTDEP049) **Science Inquiry Skills** • Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS174 - Scootle)	**Critical and Creative Thinking** Identify and clarify information and ideas Seek solutions and put ideas into action Apply logic and reasoning Evaluate procedures and outcomes Reflect on processes Organise and process information **Personal and social capability** Make decisions Develop reflective practices Work independently and show initiative Recognise emotions Understand themselves as learners Become confident, resilient and adaptable **Literacy** Understand learning area vocabulary Understand how visual elements create meaning

Assessment

Formative Assessment

- Students will learn about networks and gain an understanding of terminology such as Nodes, Edges, Path Length, Degrees and Hubs.
- Students will calculate graph properties of an example brain network, then compare 2 different brain networks and make inferences on what the differences in these 2 networks mean for network efficiency.
- Students will use small group collaboration to add to their design of an entity/machine that represents their brain region.

Equipment List

- Brain PowerPoint Lesson 2
- Data Collection Sheet 3
- Stationery, coloured pencils and pens
- Blank A4 paper for group drawings and designs
- Student Handouts collected at the end of Lesson 1:
    - Data Collection Sheet 1
    - Data Collection Sheet 2
    - 7 Regions of the Brain
    - Machine designs started in Lesson 1

Phase/Slide	Learning Activity	Resources
Slide 1 – 3 Engage	• Greetings/introduction • Acknowledgement of Traditional Custodians • Lesson Aims/Attributes	PowerPoint
Slide 4	• Warm up game (optional)	PowerPoint
Slide 5 - 6 Reflect	• Recap from Brain lesson 1 • Explain that today we will study in more detail how the regions work together to carry out executive functions.	PowerPoint
Slide 7 Explore	• Explain that research has informed us that our brain is always working and sending messages along its network even when at rest. • View video	PowerPoint and Video
Slide 8	• Introduce the concepts of nodes and edges, using a transport network analogy to demonstrate.	PowerPoint

Phase/Slide	Learning Activity	Resources
Slide 9 Logic	• Introduce the term "graph theory" and describe how mathematics and imaging can be used to investigate brain networks. • View video • Ask students what properties are important for a network to work well	PowerPoint and Video Data Collection Sheet 3
Slide 10 – 11 Explain	• Explain the basic terminology and properties of graphs – nodes, edges and hubs • Ask students to calculate the number of nodes and edges in our graph • Check answers • Any questions	PowerPoint Data Collection Sheet 3
Slide 12 – 13 Logic	• Explain another graph property – degrees • Ask Students to calculate how many edges each node has and find the average. • Check answers • Any questions	PowerPoint Data Collection Sheet 3
Slide 14 – 15 Logic	• Explain the concept of path length – how connected each node is to every other node • Ask Students to calculate the number of edges a message needs to travel down to reach every other node and find the average • Check answers	PowerPoint Data Collection Sheet 3
Slide 16 – 19 Logic	• Explain that we can use graph theory to compare brain networks and distinguish between a healthy brain and a diseased or impaired brain. • Ask students to compare the two brain networks by firstly calculating degrees and path length for Brain B, and then compare with Brain A • Discuss answers. • Describe how, through simple math's, comparisons between 2 x graphs (brains) can be made.	PowerPoint Data Collection Sheet 3
Slide 20 -23 Problem Solve	• Ask students to calculate the efficiency for brain A and B • Check Answers • Discuss what we can say about a Brain's efficiency	PowerPoint Data Collection Sheet 3
Slide 24 - 25	• Explore some real-world applications of graph theory and look at some published research investigating disease progression.	PowerPoint and videos

Phase/Slide	Learning Activity	Resources
Slide 26 – 27 Collaborate	• Ask students to work in groups formed last session to build on the design of their group's brain region. • Using new knowledge from lesson 2 students add to their designs something to assist in easier or more efficient communication • Ask groups to share their designs with the class.	PowerPoint Handouts collected at end of Lesson 1
Slide 28 - 31	• Ask students to write down 3 things they learnt in today's session. • Discuss what was learnt. • Any questions • Explain what will be learnt next lesson. • Collect handouts for next lesson.	PowerPoint Data Collection Sheet 2 (collected from last lesson)