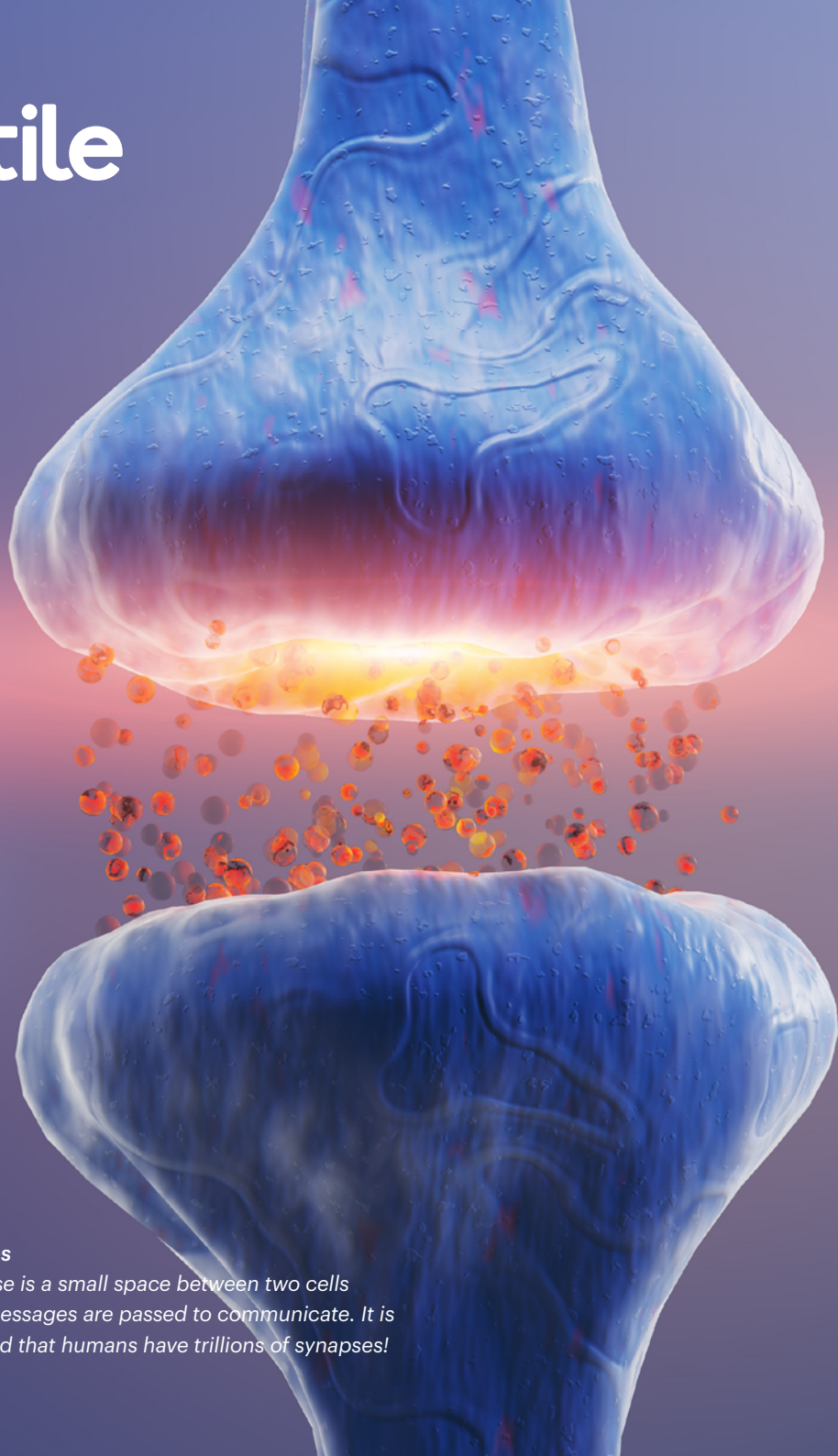
Stile

The Nervous System

How can your gut influence your mood?

Teaching Plan and Lab Guide



Synapses
A synapse is a small space between two cells where messages are passed to communicate. It is estimated that humans have trillions of synapses!

Version 2.0

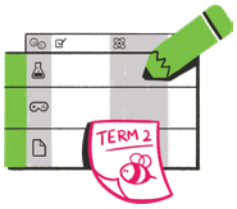
Everything in one place

Stile is a complete science curriculum. Our digital lessons and hard-copy booklets are designed to help students be the best learners they can be and to give you the tools to do what you do best: teach.

Teacher resources

Student resources

Before class



Find out everything you need to know from the unit's **Teaching Plan** and **Lab Guide**.

In **Prepare Mode** for each lesson, you can:
- Read the detailed teaching notes
- Print a copy to refer to in class
- Customise resources for the needs of your students

Stile X phone app
- Front-load the unit's scientific terminology through flashcards and quizzes

During class

Within **Teach Mode** you can:
- Implement explicit teaching with learning goals and Key Questions
- Use videos, images and text to guide your instruction
- Facilitate discussion with live brainstorms and polls
- View student data instantly to inform your teaching

Stile Classroom
- Engage in real-world phenomena through:
  - Practical activities
  - Research projects
  - Classroom lessons
  - Hands-on activities
  - Breaking news
  - Extension lessons
  - Engineering challenges
  - Open-ended investigations

After class

To **Analyse** student work:
- View data in Analyse Mode to determine your next teaching steps
- See a bird's-eye view of student progress in the Markbook
- Release model answers to students
- Provide written feedback where it matters most

Stile X booklets
- Consolidate and revise material learned in class by:
  - Creating structured revision notes
  - Recording definitions in the glossary
  - Completing practice test questions

Stile X phone app
- 60-second summary videos recap key ideas from the Stile lesson

Scan here to view **The Stile Guide**, the essential guide to supercharging your teaching with Stile

Teaching Plan

Storyline and real-world phenomenon

How can your gut influence your mood?

Ever had butterflies in your stomach or felt hangry? Then you may already have a hunch about the connection between your stomach and how you feel. It turns out there's much more to this story than previously thought.

In this unit, students explore cutting-edge scientific discoveries about how the gut and brain interact. These studies suggest that the health of your gut might influence your thoughts, feelings and behaviour. With this real-world context, this unit provides students with plenty of food for thought!

Big ideas

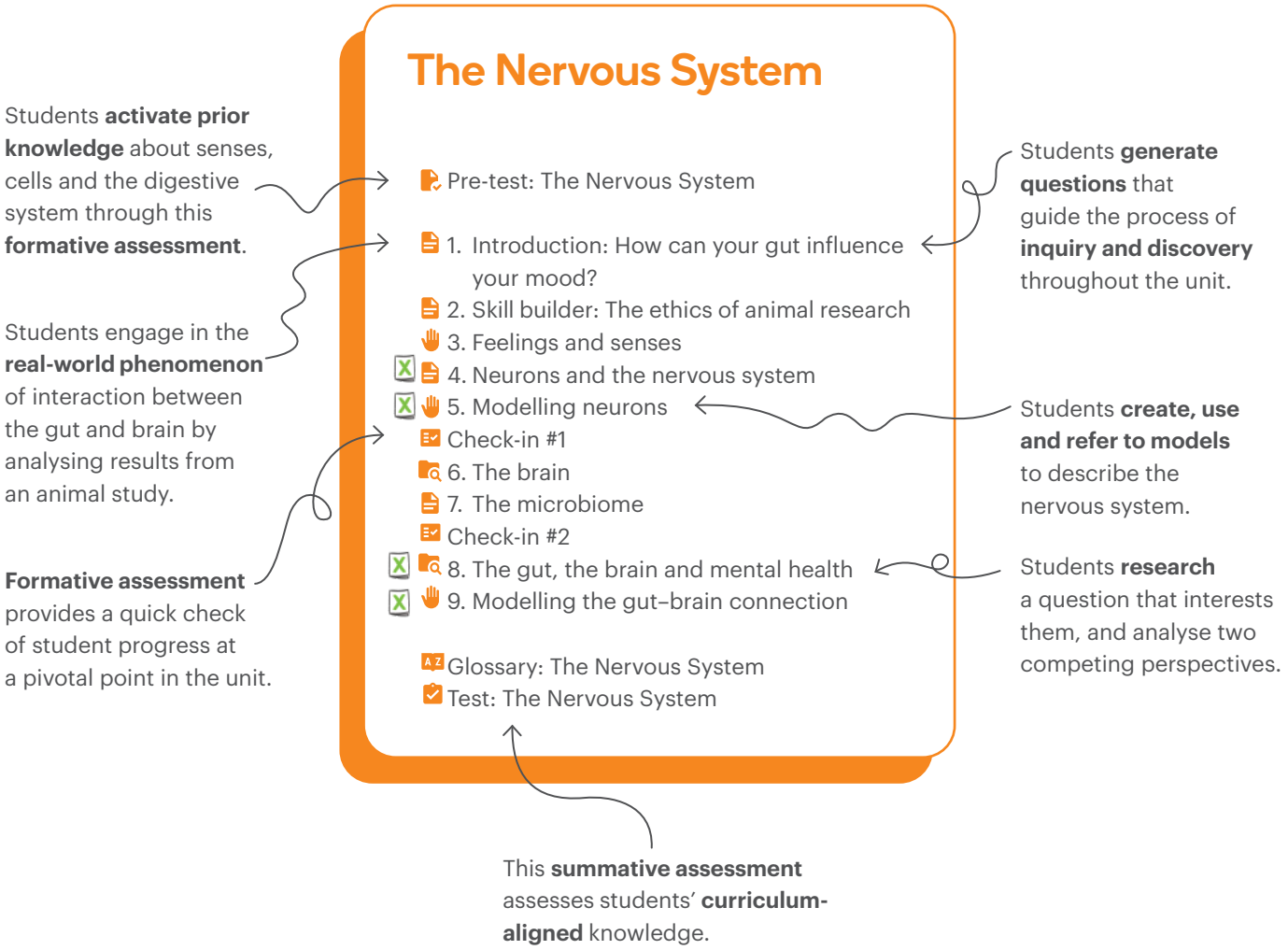
- What is anxiety and when does it impact our mental health?
- Is it OK to experiment on animals?
- How do we sense and interpret the world around us?
- How do our brains control our behaviour and memories?
- What is the microbiome and how can it influence our feelings?

Highlights

- Design a multi-sensory experience to provoke an emotional response
- Model how neurons communicate using dance moves and bubbles
- Investigate the pros and cons of poo transplants
- Collect puzzle pieces to build a model showing the gut-brain connection

This unit at a glance

This unit is designed to take three weeks, with four 45-minute class sessions per week.



- Classroom lesson
- Extension lesson
- Pre-test
- Check-in
- Glossary
- Test
- Breaking news
- Practical activity
- Research project
- Hands-on activity
- Engineering challenge
- Open-ended investigation

This icon indicates lessons that have additional revision and consolidation material available in **Stile X**, our hard-copy study booklet and accompanying app.

**The Stile X booklet for this unit will be available for the 2024 school year.*

Unit storyline

Throughout this unit, students engage with the nature of science through a cutting-edge topic where evidence is still being gathered. The use of multiple phenomena supports students to develop scientific skills and understanding. The progression of these phenomena, and how they are observed within lessons, is detailed below.

Phenomenon	Lesson	
The gut–brain interaction	**1. Introduction** – Students engage with recent science news headlines, which prompt them to generate questions about gut–brain interaction – They analyse the results of a real experiment on mice **(Needham et al., 2022.)** that shows certain gut microbes can increase anxiety	
The use of animals as models in science	**2. The ethics of animal research** – By considering the case of a scientist experimenting on himself, students question the value of animal experiments – This leads them to compare the positive and negative aspects of animal experimentation throughout history – Students use ethical frameworks to consider a variety of perspectives on animal experimentation, then form an opinion and justify it	

Phenomenon	Lesson	
The effect of senses on emotions	**3. Feelings and senses** – Students reflect on a video of a spider crawling on someone's arm to identify their emotional and behavioural responses – They design their own multi-sensory experience to understand how sensory inputs provide information that leads to emotional responses and behaviour	
The role of our senses in reactions and reflexes	**4. Neurons and the nervous system** – Students consider what a goalkeeper needs to do to defend a goal – They examine models of neurons to explain how the nervous system responds to a stimulus	

Unit storyline

Phenomenon	Lesson
The transmission of information from our senses to the brain	**5. Modelling neurons** – Students develop their own model to represent how neurons transfer information to each other – This will allow them to apply the same idea to communication between the gut and brain via the vagus nerve
Damage to specific brain areas can change memory, emotions and behaviour	**6. The brain** – The case of a man who suffered damage to part of his brain and lost his ability to form new memories prompts students to consider how memories form and why they're important – Students examine evidence that different parts of the brain serve different functions, including the parts involved in the gut's influence on emotions

Phenomenon	Lesson
Poo transplants as a treatment for mental health	**7. The microbiome** – Students learn about the use of poo transplants to treat illness through four real scientific research papers. This sparks questions about the importance of gut microbes for our mental health – Students compare and critique arguments about the use of poo transplants to improve mental health
The effect of bacteria in milk on anxiety in mice	**9. Modelling the gut-brain connection** – Students apply their knowledge and skills developed throughout the unit to analyse an experiment showing an example of gut–brain interaction – They develop a model to show their understanding of how the nervous system works and how systems interact

Curriculum alignment

This unit focuses on the nervous system and how feedback mechanisms work within the human body. Detailed alignment information can be found at the links below.

Click here to view curriculum alignment for Version 8.4 of the Australian Curriculum

Click here to view curriculum alignment for Version 9 of the Australian Curriculum

Click here to view alignment for the NSW Syllabus for the Australian Curriculum

Click here to view curriculum alignment for the Victorian Curriculum

Click here to view curriculum alignment for the Western Australian Curriculum

Prior knowledge

This unit is written with the assumption that students have some existing subject knowledge.

Before beginning this unit, students should be familiar with:

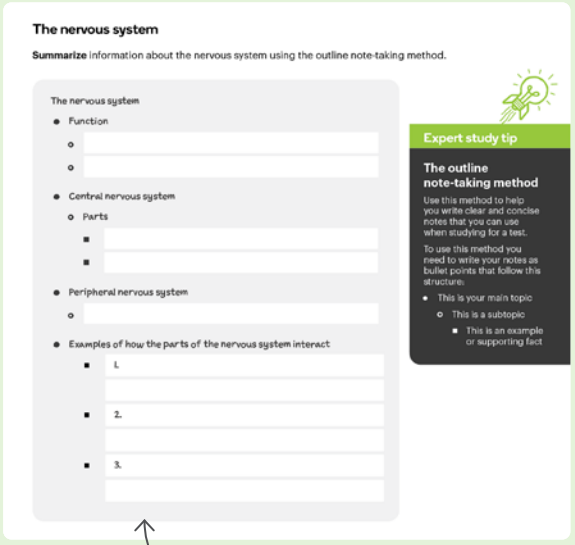
- Naming and classifying organisms using the Linnaean classification system (**Classification and Biodiversity** unit)
- The concept of biodiversity, and representing the flow of energy within an ecosystem using food chains and food webs (**Classification and Biodiversity** and **Food Chains and Food Webs** units)
- Cells as the basic unit of living things, and the structure and function of cell organelles (**Cells** unit)
- The relationship between cells, tissues and organs within an organ system and how these systems enable an individual's survival (**Cells** and **Body Systems** units)

Stile X: The Nervous System

What's in the Stile X booklet?

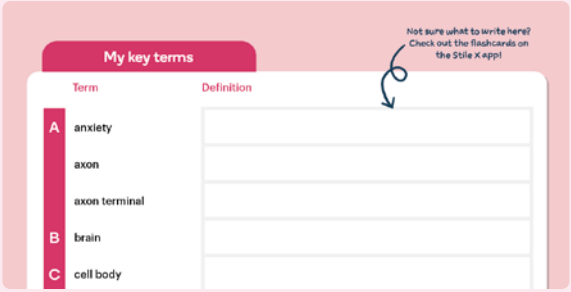
Model how to complete the structured **revision notes** as students fill in sections of these pages in class. Any remaining sections can be done at home before the next lesson. As students become more familiar with Stile X, increase independent use both at home and in class.

This unit includes **revision notes** for:
- Feelings and senses
- Neurons and the nervous system
- The brain
- The microbiome



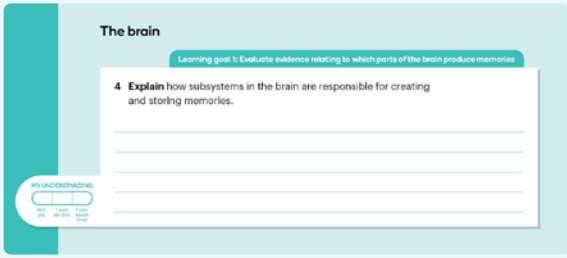
Read **expert study tips** aloud and discuss them in class to help students build important study skills.

When you see a bolded word in Stile, ask students to turn to the **glossary** pages to record the definition in their own words.



The **practice test** is perfect for revision. Fast finishers can even complete questions as an extension activity during class time. Each question addresses a learning goal from the unit's core lessons.

- Create a model to describe how sensory inputs cause responses
- Explain using models how the nervous system transmits information
- Evaluate evidence relating to which parts of the brain produce memories
- Analyse evidence that changing a person's microbiome can improve their mental health



Assessment

Stile's assessment tasks require students to apply general capabilities, skills and knowledge to explain phenomena and solve problems. We recommend using the formative assessment opportunities listed to gauge student progress, which will guide your next teaching steps. Self-assessment opportunities are also included in both Stile and Stile X to encourage metacognitive monitoring. Summative assessment tasks are designed to show what a student has learned throughout the unit and can be used to inform your reporting.

Formative assessment

Key Questions

A Key Question is an opportunity for students to demonstrate their progress against a learning goal. Stile lessons include one Key Question for each learning goal. Using the in-class analytics available in Teach Mode, you can use Key Questions to make quick, frequent judgements about student progress. We strongly recommend that you focus on these questions when providing written feedback.

Check-in

Two check-in lessons have been included as formative assessment opportunities. Check-ins contain self-marking multiple choice and drag and drop questions that will give you a quick snapshot of student learning at pivotal points in the unit. Student results in a check-in assessment will help you determine whether students are ready to progress to the next phase in the learning cycle, or whether further teaching is required.

Lesson type	Lesson name	Question types	Time
Check-in	Check-in #1	Multiple choice, drag and drop	5–10 minutes
Check-in	Check-in #2	Multiple choice, drag and drop	5–10 minutes

Summative assessment

Test

This unit contains a test to provide summative assessment of student learning across the whole unit.

Lesson type	Lesson name	Question types	Time
Test	Test: The nervous system	Multiple choice, short answer, fill-in-the-gaps	45 minutes

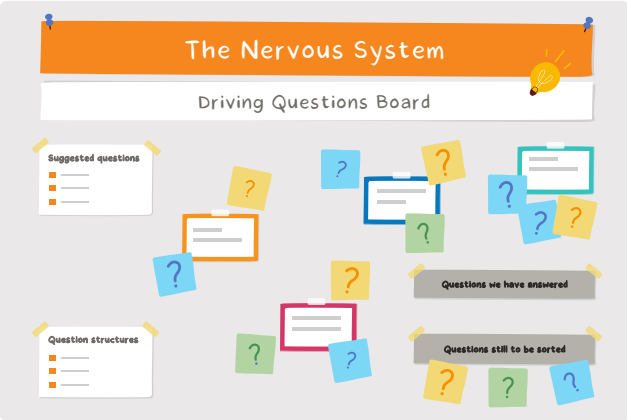
Scientific skills

One project within this unit can be used as a summative assessment of science inquiry skills.

Lesson type	Lesson name	Question types	Time
Research project	Modelling the gut–brain connection	Practical activity	45 minutes

Important things to know about this unit

Driving Questions Board



The Driving Questions Board is a visible record of questions generated by students as they develop the curiosity that drives their learning throughout the unit.

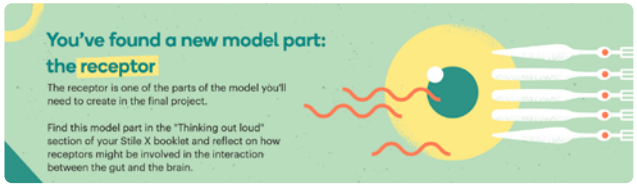
At the end of the introduction lesson, you'll be asked to set up your Driving Questions Board. You can use the template lesson from Stile's Teacher Resources unit to guide the process. Visit **stileapp.com/go/dqbtemplate** to access the template.

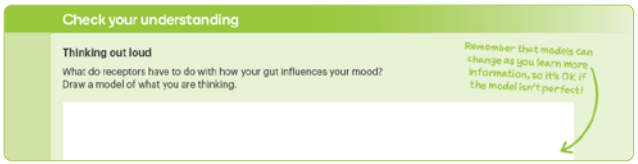
Throughout the unit, you'll be prompted to return to the board and encourage students to review their wonderings, consider what they've learned, answer any questions, and formulate new ones. We encourage you to refer to the board as you start and finish lessons to help students connect their questions to their learning.

Your Driving Questions Board will look different depending on your classroom and circumstances. If you teach this class in the same room every lesson, you could make a wall display. If you move between classrooms, consider using large pieces of paper instead.

Read more about Driving Questions Boards and how to use them in our blog post at **stileapp.com/go/dqbblog**.

Model parts





Throughout the unit, students collect parts of the model they'll need to create in their final project. These parts are provided in the form of banners within Stile lessons. Each time a model part is introduced, students are prompted to go to their Stile X booklets and complete the relevant "Thinking out loud" section.

**The Stile X booklet for this unit will be available for the 2024 school year.*

Character conversations

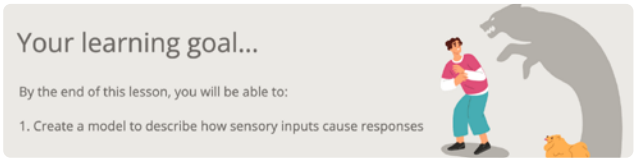
Mouse, brain, stomach and neuron characters are included throughout the unit, and speech bubbles are used as a bridge between sections of the lesson and to provide light humour. Where character conversations appear, they should be read in the same way as other sections of text. You might read the conversations aloud, or ask students to "play" the role of a specific character within the lesson.

The role of the guiding question

Student curiosity and questioning drive the learning in this unit. Students frequently contribute their questions to the Driving Questions Board, and these questions are drawn upon to drive the learning from the students' perspectives. The guiding question, "How can your gut influence your mood?" is introduced in Lesson 1. It acts as a support around which you can facilitate discussion, and support students to connect their own questions to the targeted materials.

Important things to know about this unit

Learning goals



While student curiosity and questioning drive the learning, the design of the unit as a whole supports students to make sense of phenomena and design solutions. The use of learning goals guides them toward specific outcomes in each lesson, so that their learning builds toward understanding the phenomenon and designing a solution to the problem. Evidence shows that students who know what is expected of them are more likely to engage in the learning process and achieve better learning outcomes (Hattie, 2012). These goals are introduced following an initial opportunity for students to explore the phenomenon, so that the opportunity for inquiry is maintained.

Parent email template

This unit includes a pre-written email template that you can use to inform parents about what students are learning in class. You'll find a link to this template in the teacher notes at the bottom of the unit's folder in your Stile subject or you can go to **stileapp.com/go/parentemailnervous**.

Copy the text, paste it into an email, and modify it to suit. This is a great way to bridge the gap between school and home, and engage parents in their child's learning.

Resources

Lab equipment
While this unit does include hands-on practical tasks, none of these require chemicals or laboratory equipment. Instead, these activities require general craft materials, which are listed below.

Printed resources
Lesson 2. Skill builder: The ethics of animal research requires students to use **Ethical Hats Cards**. You will need to print one set for each group of 4–6 students. These should be printed and cut into individual cards prior to the lesson. You may also wish to laminate the cards if they will be used with multiple groups of students.

Craft materials
The following lessons require students to build models from basic craft materials. Below is a list of suggested materials for the activities in lessons 5. Modelling neurons and 9. Project: Modelling the gut-brain connection. These quantities would be suitable for a class of 30 students to use throughout the whole unit.

- ☐ Pipe cleaners (approx. 200)
- ☐ String or yarn (2–3 balls)
- ☐ Beads (approx. 500)
- ☐ Modelling clay (approx. 1 kg)
- ☐ Pom-poms (approx. 500)
- ☐ Popsicle sticks (approx. 500)
- ☐ Craft glue (approx. 5 x 225 mL bottles)
- ☐ Sticky tape (5 large rolls)
- ☐ Scissors (one pair per student)
- ☐ Poster paper (approx. 60 sheets)
- ☐ Coloured pencils or crayons

Student supplies
Each student will need:
- ☐ A device to access Stile lessons
- ☐ A Stile X booklet for this unit

Stationery

Driving Questions Board
You will need stationery items to create the Driving Questions Board for this unit. The required items will vary depending on how you choose to set this up. Required items might include:

- ☐ Non-permanent glass markers
- ☐ Post-it notes (4 x stacks) and pens or markers (one for each student)
- ☐ Index cards (approx. 100) and thumb tacks (approx. 100)
- ☐ Large pieces of paper x 10
- ☐ 2 x different coloured markers or stickers (these are used to indicate when questions have been answered)

Each student will need:
- ☐ A pen or pencil to complete answers in Stile X
- ☐ Coloured pencils to complete mindful colouring activities in Stile X

Lesson Planning Guide

Week 1 · Week 2 · Week 3

The guide below is based on four 45-minute sessions per week.
Click here to download an editable version of this planning guide.

	Lesson name	Learning goals	Preparation required?	Ice breaker	Core of the lesson	To close	Revision and mastery
Session 1	**Pre-test: The Nervous System**	Demonstrate prior knowledge of the nervous system	Review teaching notes in Prepare Mode Collect Stile X booklets for this unit Find out more about using Stile X in **The Stile Guide** **Send parent email template** 10 minutes	Explain that you are starting a new unit about the nervous system, and students will complete a pre-test to help you find out what they already know	Students complete a pre-test to show what they already know about the nervous system	As they finish the pre-test, students can read **"Explainer: What is anxiety?"** from *Science News Explores* to gain context for the next lesson Hand out Stile X booklets and activate Stile X app	Stile X app: Flashcards
Session 2	**1. Introduction: How can your gut influence your mood?**	Propose questions to clarify evidence about how the brain and gut interact	Review student answers to **Pre-test: The Nervous System** in Analyse Mode to gauge students' prior knowledge Review teaching notes in Prepare Mode 20 minutes	As a class, brainstorm things that can make someone feel worried or anxious	Students analyse the results of a real experiment on mice and ask questions about gut-brain interaction	Introduce students to the Driving Questions Board and ask them to come up with any questions they have at this point in the unit	Stile X app: Flashcards Glossary terms: anxiety, gut, microbe
Session 3	**2. Skill builder: The ethics of animal research** MATERIALS REQUIRED	Discuss arguments for and against the use of animal experiments in science	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode Print and cut out **Ethical Hats cards** for each group 30 minutes	As a class, read about Barry James Marshall, a scientist who conducted an experiment on himself. Then complete a *Think, Pair, Share* routine	Students consider different perspectives on animal experimentation	As a class, discuss whether students' positions on using animal models in scientific research have changed since the beginning of the lesson	Stile X app: Flashcards
Session 4	**3. Feelings and senses**	Create a model to describe how sensory inputs cause responses	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, watch the video of a spider crawling on someone's arm and complete a live brainstorm	Students design a multi-sensory experience to learn how sensory input leads to emotions and behaviour	As a class, review and discuss students' answers about healthy and unhealthy anxiety Direct students to the corresponding Stile X revision notes and then introduce the "Thinking out loud" task at the end	Stile X app: Feelings and senses video Stile X Revision notes: Feelings and senses Glossary terms: mechanical input, chemical input, electromagnetic input, receptor

Lesson Planning Guide

Week 1 · Week 2 · Week 3

	Lesson name	Learning goals	Preparation required?	Ice breaker	Core of the lesson	To close	Revision and mastery
Session 5	**4. Neurons and the nervous system**	Explain using models how the nervous system transmits information	Provide feedback on the Key Questions from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, watch the video of a goalkeeper preparing to save a penalty kick and complete the live brainstorm about which parts of the body they will use to stop the ball	Students refer to the goalkeeper as a model of the nervous system's response to a stimulus	Direct students to the corresponding Stile X revision notes and then introduce the "Thinking out loud" task at the end Assign **Check-in #1** as homework to be completed before the next lesson	Stile X app: Neurons and the nervous system video Stile X Revision notes: Neurons and the nervous system Glossary terms: nervous system, neuron, axon, axon terminal, dendrite, synapse
Session 6	**5. Modelling neurons** MATERIALS REQUIRED	Develop and use a model to describe how sense organs communicate with the brain	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode Collect materials listed in the Lab Guide 30 minutes	As a class, review answers to **Check-in #1** In small groups, students will build a physical model of a neuron, then share it with the class	Students use their models to understand communication between the gut and brain	As a class, discuss the Challenge Question. Review any student responses in Teach Mode, or work together to develop an answer	Stile X app: Flash Quiz
Session 7	**6. The brain**	Evaluate evidence relating to which parts of the brain produce memories	Provide feedback on the Key Question from the previous lesson in Analyse Mode Ensure each student has access to a device Review teaching notes in Prepare Mode 20 minutes	Revisit the Driving Questions Board and identify any questions related to memories or the brain	Students examine evidence that parts of the brain serve specific functions, and some parts might be involved in the gut's influence on emotions	Direct students to the corresponding Stile X revision notes and explain the article analysis task using the instructions and example then introduce the "Thinking out loud" task at the end	Stile X app: The brain video Stile X Revision notes: The brain Glossary terms: brain
Session 8	**7. The microbiome**	Analyse evidence that changing a person's microbiome can improve their mental health	Provide feedback on the Key Questions from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	Read about poo transplants and vote in a live poll about different medical treatments	Students compare and critique arguments about using poo transplants to improve mental health	Direct students to the corresponding Stile X revision notes to complete the "Thinking out loud" task at the end Assign **Check-in #2** as homework to be completed before the next lesson	Stile X app: Flash Quiz Stile X app: The microbiome Stile X Revision notes: The microbiome

Lesson Planning Guide

Week 1 · Week 2 · **Week 3**

	Lesson name	Learning goals	Preparation required?	Ice breaker	Core of the lesson	To close	Revision and mastery
Session 9	**8. The gut, the brain and mental health**	Propose questions about the evidence for a claim Compare two arguments related to a scientific question	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode 20 minutes	As a class, review answers to **Check-in #2** Revisit the Driving Questions Board and encourage students to identify a question they'd like the answer to	Students explore a question of their choice from the Driving Questions Board	Ask students to reflect on their thinking with the *Think, Puzzle, Explore* routine	Stile X app: Flash Quiz Study Revision notes in preparation for **Test: The nervous system**
Session 10	**9. Modelling the gut–brain connection** MATERIALS REQUIRED	Propose questions to clarify the connection between gut microbes and the brain Construct a model to explain how gut microbes can influence the brain	Provide feedback on the Key Question from the previous lesson in Analyse Mode Review teaching notes in Prepare Mode Collect craft materials for students to create their models 25 minutes	Introduce students to the study described in the lesson	Students develop a model to show their understanding of the nervous system and how systems interact	Complete a gallery walk so students can see each other's models	Stile X app: Flash Quiz Study Revision notes in preparation for **Test: The nervous system**
Session 11	**Unit Review**		Review Key and Challenge Questions from the unit in Analyse Mode to identify areas to revisit with students during the lesson 30 minutes	Introduce students to the practice test section of Stile X and explain how it will help them to prepare for the test	Revisit any areas of difficulty as a class or with groups of students	Encourage students to review feedback and model answers from the unit for revision	Stile X app: Flash Quiz Study Revision notes in preparation for **Test: The nervous system**
Session 12	**Test: The nervous system**		Ensure each student has access to a device	Seat students appropriately for the test	Supervise students as they complete the test	Fast finishers can complete mindful colouring activities in Stile X	Stile X: Reflection

Lab Guide

COMING SOON

Call us on 1300 918 292

Email us at community@stileeducation.com

Swing by the office to say hi!
Level 5, 128 Exhibition Street, Melbourne, Victoria

Stile HQ is located on the traditional lands of the Boon Wurrung and Woiwurrung (Wurundjeri) peoples of the Kulin Nation. We acknowledge that sovereignty was never ceded and pay our respects to Elders past, present and future.