EDU701 - The Brain And Learning

EVIDENCE-INFORMED

Teaching Guide

Supporting Students from Novice to Expert

TEACHER TOOLKIT

Portfolio -1

Lee Gras

Understanding the novice learner

HOW LEARNING WORKS

annotations:
This resource translates evidence about novice learning, knowledge acquisition and cognitive load into practical teaching guidance. It explains how students progress from novice towards expertise and provides evidence-informed principles that support instructional planning and classroom decision-making.

Students should experience structured learning that builds on prior knowledge, reduces unnecessary cognitive load, supports schema development and promotes increasing independence as expertise develops.

Teachers should understand that effective instruction requires recognising novice learners, explicitly teaching new knowledge, monitoring student understanding, and adjusting instructional support in response to evidence of learning.

EVERY STUDENT IS A NOVICE SOMEWHERE

STUDENTS BECOME NOVICES WHENEVER THEY ENCOUNTER UNFAMILIAR KNOWLEDGE OR SKILLS. WITHOUT WELL-DEVELOPED SCHEMAS IN LONG-TERM MEMORY, THEY RELY HEAVILY ON WORKING MEMORY TO PROCESS NEW INFORMATION, MAKING LEARNING MENTALLY DEMANDING.
UNDERSTANDING THIS HELPS TEACHERS DESIGN INSTRUCTION THAT INTRODUCES NEW LEARNING IN MANAGEABLE STEPS WHILE BUILDING ON WHAT STUDENTS ALREADY KNOW.

IN PRACTICE

When introducing unfamiliar learning:

- activate relevant prior knowledge
- explicitly teach new concepts and skills
- sequence learning from simple to more complex
- provide appropriate support before expecting independence

KEY PRINCIPLE

Expertise is domain-specific. A student may demonstrate expertise in one area while remaining a novice in another.

EVIDENCE BASE:

- Activate relevant prior knowledge — Deans for Impact (2015), p. 3
- Explicitly teach new concepts and skills —Kirschner, Sweller & Clark (2006), p. 80, Sweller (2021), p. 9
- Sequence instruction from reduced initial complexity toward more complex material as learner expertise develops — Martin & Evans (2018), p. 4
- Provide appropriate support before expecting independence — Martin & Evans (2018), p. 4
- Expertise is domain-specific — Sweller (2011), pp. 299, 321.

HOW LEARNING WORKS

How expertise develops

LEARNING OCCURS AS NEW KNOWLEDGE IS ORGANISED INTO SCHEMAS IN LONG-TERM MEMORY. AS THESE SCHEMAS BECOME STRONGER AND MORE CONNECTED, STUDENTS RELY LESS ON WORKING MEMORY AND CAN THINK MORE EFFICIENTLY, RECOGNISE PATTERNS AND SOLVE INCREASINGLY COMPLEX PROBLEMS.

NOVICE LEARNER	EXPERT LEARNER
Limited prior knowledge	Extensive organised knowledge
Relies on working memory	Retrieves knowledge efficiently from long-term memory
Focuses on individual steps	Recognises patterns and relationships
Requires explicit instruction	Applies knowledge independently
Benefits from modelling and scaffolding	Transfers knowledge flexibly

IN PRACTICE

Teachers support progression by:

- modelling new learning
- using worked examples
- providing guided practice
- gradually reducing support as understanding develops

EVIDENCE BASE:

- Modelling new learning — Sweller (2021), p. 8
- Using worked examples — Kirschner, Sweller & Clark (2006), p. 80 (printed page 80 / PDF page 7)
- Guided practice — Martin & Evans (2018), p. 4
- Gradually reducing support — Martin & Evans (2018), p. 4

HOW LEARNING WORKS

Making Responsive Instructional Decisions

EFFECTIVE TEACHING IS RESPONSIVE. TEACHERS INTRODUCE NEW LEARNING WITH APPROPRIATE SUPPORT, THEN CONTINUOUSLY OBSERVE STUDENT THINKING AND PERFORMANCE, ADJUSTING INSTRUCTION AS STUDENTS DEMONSTRATE INCREASING EXPERTISE.

Signs that students may be experiencing excessive cognitive load include:

- hesitation before beginning
- repeated procedural questions
- losing track of instructions
- relying on copying rather than understanding
- disengagement or frustration

These behaviours may indicate that the demands of the task exceed the learner's current knowledge.

Teachers can respond by:

- breaking learning into smaller steps
- removing unnecessary information
- modelling again
- providing additional guided practice
- reducing scaffolds as students become more confident and independent

Evidence base:

- Recognising cognitive overload — Martin & Evans (2018), pp. 206,208
- Breaking learning into smaller steps — Bloom (1968), p. 10 of PDF
- Providing additional guided practice — Bloom (1968), p. 11 of PDF
- Reducing scaffolds as understanding develops — Kirschner et al. (2006), p. 80

Principles for Evidence-Informed Teaching

RESEARCH FROM COGNITIVE SCIENCE AND EDUCATIONAL NEUROSCIENCE HELPS TEACHERS UNDERSTAND HOW STUDENTS LEARN. WHILE IT DOES NOT PRESCRIBE WHAT TEACHERS SHOULD TEACH, IT PROVIDES EVIDENCE TO INFORM INSTRUCTIONAL DECISIONS BEFORE, DURING AND AFTER LEARNING.

Evidence-informed teachers:

- build on prior knowledge
- manage intrinsic and extraneous cognitive load
- explicitly teach new knowledge
- use worked examples and guided practice
- monitor student thinking throughout the lesson
- adjust instructional support in response to evidence of learning
- gradually release responsibility as expertise develops

Key Takeaway

Effective teaching begins with understanding how students learn. By designing instruction that supports working memory, builds schemas and responds to evidence of student learning, teachers create the conditions for every learner to progress from novice to expert.

Evidence base:

- Build on prior knowledge — Deans for Impact (2015), p. 3
- Manage intrinsic and extraneous cognitive load — Martin & Evans (2018), p. 8; Sweller (2015), p. 6
- Use worked examples and guided practice — Sweller (2011), p. 318.
- Monitor student understanding throughout the lesson — Bloom (1968), p. 10.
- Adjust instructional support in response to evidence of learning — Bloom (1968), pp. 10–11.
- Gradual release of responsibility as expertise develops – Martin & Evans (2018), pp. 205–206; Kirschner, Sweller, & Clark (2006), p. 80.

HOW LEARNING WORKS

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EVIDENCE-INFORMED lesson planning framework

A practical planning tool that helps teachers apply learning science

before,
during,
and after a lesson.

TEACHER TOOLKIT
Portfolio Piece-2

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BEFORE TEACHING, CONSIDER THE QUESTIONS BELOW TO DESIGN INSTRUCTION THAT SUPPORTS LEARNING AND REDUCES UNNECESSARY COGNITIVE LOAD.

1. Learning Goal

What knowledge or skill should students know or be able to demonstrate by the end of the lesson?

2. Prior Knowledge

What knowledge, vocabulary or skills do students already need before beginning this lesson?

3. New Learning

What is genuinely new for students?

4.Cognitive Load

Intrinsic Load: What makes this content inherently difficult?

- ☐ New vocabulary
- ☐ Multiple steps
- ☐ Abstract concepts
- ☐ Complex procedures
- ☐ Other

Extraneous Load: How can unnecessary cognitive load be reduced?

- ☐ Simplify instructions
- ☐ Remove unnecessary information
- ☐ Sequence learning clearly
- ☐ Use clear visual examples
- ☐ Model expectations
- ☐ Other

HOW TEACHERS PLAN

HOW TEACHERS PLAN

Explicit Instruction

How will you introduce the new learning?

- ☐ Explain
- ☐ Demonstrate
- ☐ Think aloud
- ☐ Use worked examples

Notes:

Guided Practice

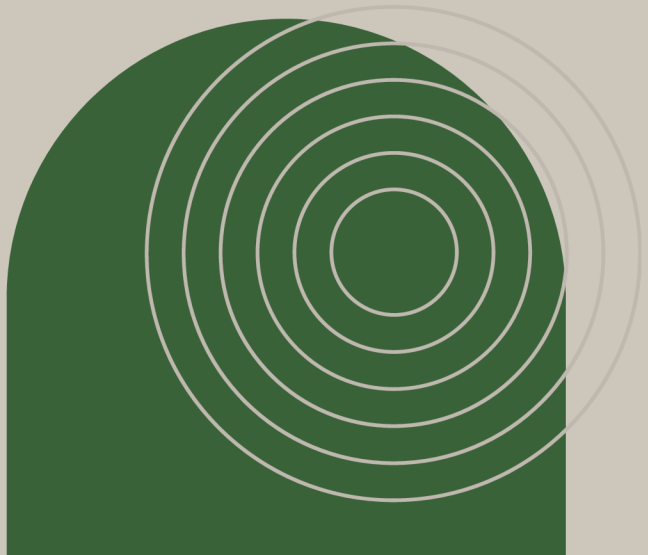
How will students practise while receiving teacher support?

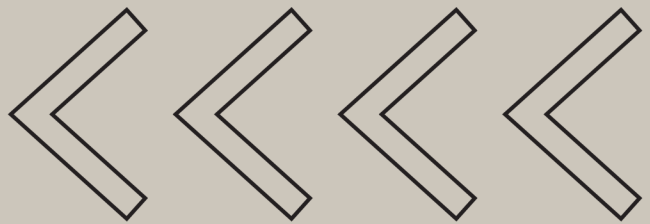
Independent Practice

How will students demonstrate increasing independence?

Feedback

How will students receive feedback during learning?





EFFECTIVE TEACHING IS RESPONSIVE, WITH TEACHERS ADJUSTING INSTRUCTIONAL SUPPORT THROUGHOUT THE LESSON IN RESPONSE TO EVIDENCE OF STUDENT LEARNING.

What will you look for?

Evidence students may need additional support

- ☐ **Hesitation**
- ☐ **Confusion**
- ☐ **Repeated procedural questions**
- ☐ **Copying peers**
- ☐ **Off-task behaviour**
- ☐ **Cognitive overload**

Other observations:

Evidence students are ready for greater independence

- ☐ **Correct explanations**
- ☐ **Accurate application**
- ☐ **Independent problem solving**
- ☐ **Confident decision making**
- ☐ **Explaining reasoning**

Other observations:

Instructional response

If students require more support, I will:

If students demonstrate understanding, I will:

Evidence of Learning

How do you know students achieved the learning intention?

Reflection

what worked well?

What created unnecessary cognitive load?

What will you adjust next lesson?

annotations

This resource supports teachers to identify prior knowledge, manage cognitive load, sequence learning, provide appropriate instructional support, and use evidence of learning to inform ongoing teaching decisions.

Students should experience structured learning that builds on prior knowledge, reduces unnecessary cognitive load, supports schema development, and promotes increasing independence as expertise develops.

Teachers should understand that effective lesson planning requires deliberate decisions about what students already know, how new learning is introduced, when instructional support should be provided, and how evidence of learning should guide future instruction.

Key Principle

Effective teaching is an ongoing process of planning, observing and responding. Evidence-informed instructional decisions support students' progression from novice to expert.

Research Base

- Cognitive load – Sweller (2011, pp. 299–321); prior knowledge – Mayer (2004, p. 2); schema development – Sweller (2011, p. 299); worked examples – Kirschner, Sweller, & Clark (2006, p. 80); guidance – Kirschner, Sweller, & Clark (2006, p. 80).
- Explicit instruction – Kirschner, Sweller, & Clark (2006, p. 79); novice learners – Kirschner, Sweller, & Clark (2006, p. 80); minimal guidance – Kirschner, Sweller, & Clark (2006, pp. 85–86); independent practice – Martin & Evans (2018, pp. 205–206).
- Formative assessment – Bloom (1968, p. 10); feedback – Martin & Evans (2018, pp. 206–208); instructional adjustment – Bloom (1968, pp. 10–11).

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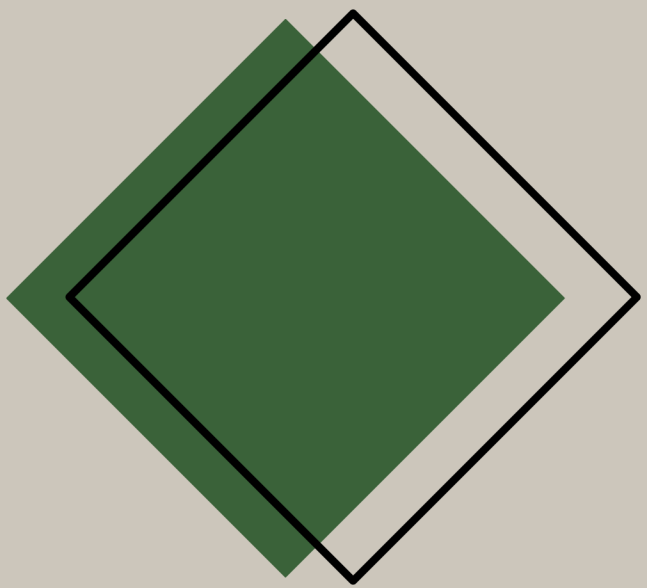
EVIDENCE-INFORMED learning reflection template

Student Reflection to Inform Responsive Teaching



TEACHER TOOLKIT

Portfolio Piece-3

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how I learn best

Student Learning Reflection

Name: _____

Class: _____

Topic: _____

Date: _____

Reflect on today's learning. There are no right or wrong answers. Your responses will help you understand your learning and help your teacher plan future lessons.

annotations

This resource encourages students to reflect on their learning before, during and after a lesson. It helps teachers gather evidence about prior knowledge, learning experiences and students' current level of independence.

Students develop awareness of what supports their learning and where they may need further explanation, practice or challenge.
Teachers can use these reflections alongside classroom evidence to monitor understanding, adjust future instruction and decide whether support should be maintained or gradually reduced.

Research Base

- Prior knowledge – Sweller (2011), p. 309; cognitive demands – Martin & Evans (2018), pp. 203, 205.
- Using evidence of learning to adjust future teaching – Bloom (1968), pp. 7, 10–11.
- Progression from explicit input, guided practice and informative feedback towards guided independent learning as fluency and automaticity develop – Martin & Evans (2018, pp. 205–206).

BEFORE THE LESSON

What did I already know about this topic?

What was completely new to me today?

Before we started, I felt:

- ❒ VERY CONFIDENT
- ❒ SOMEWHAT CONFIDENT
- ❒ UNSURE
- ❒ I HAD NO PRIOR KNOWLEDGE

DURING THE LESSON

The learning activities that helped me most were:

- ❒ TEACHER EXPLANATION
- ❒ WATCHING A DEMONSTRATION
- ❒ SEEING A WORKED EXAMPLE
- ❒ GUIDED PRACTICE
- ❒ ASKING QUESTIONS
- ❒ WORKING INDEPENDENTLY
- ❒ RECEIVING FEEDBACK

I found learning difficult because:

- ❒ THERE WAS TOO MUCH NEW INFORMATION AT ONCE.
- ❒ I NEEDED MORE EXAMPLES.
- ❒ I NEEDED MORE PRACTICE.
- ❒ I DIDN'T UNDERSTAND AN EARLIER STEP.
- ❒ I WAS DISTRACTED.

extra notes:

THINKING ABOUT MY LEARNING

I can now:

- ❒ EXPLAIN THE NEW IDEA.
- ❒ COMPLETE THE TASK WITH SUPPORT.
- ❒ COMPLETE THE TASK INDEPENDENTLY.
- ❒ EXPLAIN THE LEARNING TO SOMEONE ELSE.

I still need:

- ❒ ANOTHER EXPLANATION.
- ❒ ANOTHER WORKED EXAMPLE.
- ❒ MORE GUIDED PRACTICE.
- ❒ MORE INDEPENDENT PRACTICE.
- ❒ A GREATER CHALLENGE.

looking ahead:

HOW TEACHERS RESPOND

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Neuromyths Quick Reference

Helping teachers distinguish between common misconceptions and evidence-informed practice.

TEACHER TOOLKIT

Portfolio Piece-4

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WHY EVIDENCE MATTERS

What is a neuromyth?

Educational neuroscience and cognitive science have improved our understanding of how students learn and how teachers can support learning effectively. Despite this growing evidence base, misconceptions about the brain and learning continue to influence classroom practice. These misconceptions, known as neuromyths, often appear convincing but are not supported by current research. This quick reference contrasts common neuromyths with evidence-informed principles to support effective teaching across all learning areas.

Neuromyth	What the evidence says
Students learn best when teaching matches their preferred learning style.	There is no strong evidence that matching instruction to students' preferred learning styles improves learning. Instead, teaching methods should be selected to suit the content, learning goals and the knowledge being taught.
People only use 10% of their brain.	Brain imaging demonstrates that almost all areas of the brain are active during everyday thinking and learning. Learning involves networks across the whole brain rather than a small unused portion.
Left-brained and right-brained learners learn differently.	The two hemispheres work together during almost all learning tasks. Students cannot be accurately categorised as "left-brained" or "right-brained" learners.
More classroom activity always means more learning.	Learning is strengthened through explicit instruction, clear explanations, worked examples, guided practice and opportunities to consolidate new knowledge. Activity alone does not guarantee learning.
If students struggle, they are not learning.	Appropriate challenge is a normal part of learning. When teachers provide suitable guidance, feedback and scaffolding, productive struggle supports deeper understanding and the development of expertise.

Evidence-Informed Teaching

WHY EVIDENCE MATTERS

Research in cognitive science demonstrates that effective teaching is achieved through carefully designed instruction rather than assumptions about how students learn. Teachers are most likely to support learning when instructional decisions are informed by evidence and adjusted in response to student understanding.

Research in cognitive science demonstrates that effective teaching is achieved through carefully designed instruction rather than assumptions about how students learn. Teachers are most likely to support learning when instructional decisions are informed by evidence and adjusted in response to student understanding.

Effective teaching is strengthened when teachers:

- Explicitly teach new knowledge and skills.
- Manage cognitive load by introducing new information in manageable steps.
- Use modelling, worked examples and guided practice before expecting independent performance.
- Monitor student understanding and adjust instruction.
- Gradually reduce scaffolding as students develop greater knowledge and independence.
- Base instructional decisions on evidence rather than popular misconceptions.

Why it matters:

Evidence-informed teaching is not about following trends or applying one strategy to every learner. It involves understanding how learning occurs, interpreting evidence from the classroom and selecting instructional approaches that best support students to progress from novice towards expertise.

Key Takeaway

Understanding how students learn enables teachers to make instructional decisions that are informed by evidence rather than by common misconceptions.

Research Base

- Neuromyths are common among teachers – Dekker et al. (2012), pp. 1, 3.
- Common neuromyths (learning styles, left/right brain dominance, 10% of the brain) are not supported by evidence - Dekker et al. (2012), p. 2 ,3.
- Educational decisions should be guided by evidence rather than misconceptions about how the brain learns – OECD (2002), pp. 47–48; Dekker et al. (2012), pp. 1, 6.
- Evidence-informed teaching is based on working memory, long-term memory, cognitive load and explicit instruction – Sweller (2016), pp. 363, 366; Martin & Evans (2018), pp. 203, 205, 210.

annotations

This resource helps teachers distinguish between common neuromyths and evidence-informed teaching practices. It translates research from cognitive science and educational neuroscience into practical guidance that supports informed instructional decision-making.

Students should experience teaching that is guided by evidence rather than misconceptions about how the brain learns, resulting in more effective instruction and improved learning opportunities.

Teachers should understand that many widely accepted beliefs about learning are not supported by evidence. Effective instructional decisions should be informed by research on knowledge acquisition, cognitive load and evidence-informed teaching rather than neuromyths.

ACKNOWLEDGEMENT OF GENERAL AI USE

In accordance with the assessment guidance, generative AI was used to support organising, planning, and brainstorming for this assessment. ChatGPT (OpenAI), was used to explore concepts, refine ideas, and support the development of the portfolio resources.

All AI-assisted suggestions were critically evaluated and refined during the development of this assessment. The final submission, including the portfolio design, resource development, analysis and written content, is my own work and reflects my own understanding and learning throughout this unit.