The DREAM: How we learn

View the Science through the lens of teaching

The importance of collaboration to draw out the collective expertise from educators, neuroscientists and psychologists to inform learning.

Dr Judi Newman and Professor Ken Purnell (2025)

We are all geniuses in our own heads, believing in our worldviews based on personal experiences and learning. Expert brains have many more schemas hardwired into long-term memory, enabling faster connections when learning new content with less cognitive load. However, expertise can also lead to rigidity or narrow thinking. What we know can get in the way of new learning. Sometimes, we must unlearn to relearn and ask: *Is this belief a ground truth or an assumption I hold to be true?* This insight became clear to me when I developed a framework for how we learn.

I found that most models and professional papers highlighted only three or four factors, rarely capturing the full picture. To develop a classroom-relevant framework grounded in research, I drew from primary sources across multiple disciplines. Integrating findings from neuroscience, psychology, and education. I created the **DREAM** framework an evidence-informed model outlining the essential ingredients for learning.

Newman and Purnell can view the science through the lens of a teacher, the former being a school principal and the latter being a university professor who trains teachers. Through this lens the research can be synthesised into a framework that can be used in the classroom for planning and execution. The bibliography below includes the broader readings that shaped their thinking around the DREAM framework.

D	Downtime	**Processing time**: The brain requires an incubating period after learning to encode the data. Encoding involves strengthening the neural connections, developing spines and dendrites. Processing is about thinking about the new learning. Appropriate activities are graphic organisors (Such as a Venn diagram), peer tutoring, discussion, questioning, debate and journaling. **Brain break**: A brain break is different from processing time. A brain break is required when the brain is on cognitive load and can be defined as any joyful activity that does not involve new learning. **Sleep:** Sleep is the third downtime essential for learning.
R	Recall Repetition	**Recall**: Every time we recall we relearn. Retrieval over time is called spaced recall (Willis, 2006). If you can't recall it, you haven't learnt it. **Repetition**: Repetition with sleep in between is essential for the consolidation of learning. Practice makes progress.

E	Effort Emotion Error detection	**Effort**: Learning is an effortful process not a passive one. Without investing effort, you don't' maximise dendritic spine growth, dendrite development , myelination or the strengthening of neural networks. **Emotion**: Emotion sparks motivation and makes us pay attention and stick at something. The learner needs to be engaged so curiosity and motivation needs to spike. Positive emotion soaks dendrites in the neurotransmitters needed for brain growth such as dopamine, serotonin and oxytocin. Positive states create positive neural traits so the feeling of joy, gratitude, hope, curiosity, awe and kindness create a sound climate for learning to take place. **Error detection**: Feedback is the most effective tool for error detection. Using feedback, you can close the gap between our current brain map (what we know) and an improved brain map (deepening what we know). Struggling with new learning can also be an important part of the learning curve. When learners construct their own meaning, they learn what they come to understand. Making mistakes and correcting them strengthens what we learn.
A	Attention Application	**Attention**: You only remember what you pay attention to. Hook attention within 30minutes (Gordon, 2020) Telling a compelling story and using visuals, tapping into the ways the Reticular Activating System (RAS) is distracted. This includes anything funny, unusual, unexpected, novel, dangerous, interesting, important and pleasurable (Newman, 2020). When we are paying attention our locus coeruleus is stimulated releasing Noradrenaline, dilating our pupils and effecting our heart rate (Storoni, 2013). **Application:** If you can't apply it you won't be able to use it. The brain is context and state sensitive so apply the new learning to three different contexts. The brain struggles with transfer because it clumps information together including, where you learnt it, how you felt at the time and the content. This is an advantage if you need to recall the concept in the same context each time. However, for unpredictable things, where your performance needs to stay flexible, interleave to improve transfer and innovation.
M	Meaning Modality	**Meaning**: If the new learning is not meaningful it will not link to prior learning and connect to existing wiring. When we rote learn something in isolation, it may be stored in a remote part of our brain making retrieval difficult. Make learning relevant. **Modality**: The more areas of the brain used when learning the more pathways are created making learning more effective. Using a range of modes in teaching will use multisensory pathways . Teach the concept in different ways: Write it, read it, hear it, discuss it, draw it, act it out, question it, analyse it. The more we learn, the more we can learn.

Table 1: The DREAM Newman, (2024)

The brain is neuroplastic and changes over time

Limited learning occurs without neuroplastic changes in the brain over time. Expertise is about hard wiring neural networks over time. Talent is not a fixed trait but a biological process that develops with the right conditions, the right teacher and the right teaching execution. According to Dr Judy Willis, a students who likes their teacher, tries harder and has less anxiety.

Cross Fertilisation of Expertise

Dr Paul Zak, a neuroscientist from the USA, studied what occurs during memorable moments. In his book *Immersion* (2022), found that memorable moments involve attention, emotion, and the release of oxytocin and dopamine. Dr Stanislas Dehaene, a French neuroscientist, showed that learning involves closing the gap between our current brain maps to improved brain maps—requiring error detection. His book *How We Learn: The New Science of Education and the Brain* (2020) outlines other essential learning factors. Dr Judy Willis, a former medical doctor, neurologist, turned educator, demonstrates how spaced recall supports memory consolidation in *Research-Based Strategies to Ignite Student Learning* (2006). Dr Janet Zadina, both a teacher and neuroscientist, underscores the importance of modality in teaching, advocating for science to be interpreted through the eyes of educators. Dr Evian Gordon, a neuroscientist and medical doctor working across Australia and the USA, asserts that meaningful learning and behaviour change require neuroplasticity. His book *The Brain: From Knowing to Doing* offers valuable insights.

If professional experts collaborate, we can minimise individual bias and create more accurate and practical frameworks. **Teachers** love learning but often report that academic papers feel tedious or are too narrow, and the language is not always user friendly. Additionally, they don't have time to read widely. Yet, their insights are essential—they are highly trained in what works (and doesn't) in real classrooms.

Much of today's applied **neuroscience** is focused on wellness, not pedagogy. Scientists often present dense, text-heavy slides in lecture formats. Their concepts are not always accessible to teachers seeking strategies they can implement immediately. Without scientists, however, we lack robust data and evidence, drawn from blood tests, heart rate, brain probes and brain scan activity.

Psychology, too, offers a distinct lens—often focused on behaviour rather than pedagogy, and shaped by research into brain injury and disease. Their tools of trade often require use of testing out of the reach of teachers.

Pooling the collective wisdom of experts with academic credentials and deep, lived experience offers a richer understanding of learning. Relying on experts without classroom insight can lead to skewed conclusions, as they lack the benefit from hardwired neural pathways that come from years of practical expertise in the classroom. Frameworks must be viewed through the eyes of teachers to ensure relevance and accuracy. Even better are experts with transdisciplinary

backgrounds—those who blend neuroscience, psychology, and education—to lead this important work.

How to Use the DREAM Framework

When teachers understand how the brain learns, thinks, and remembers best, they can design pedagogy that truly improves student outcomes. The DREAM model is intended to be embedded in lesson planning and delivery. But always remember: it is the *experience* of the student that drives learning—not what is taught. Learning happens inside the head; teaching happens outside it.

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"Turns out, even geniuses need a group chat. Dr Judi Newman reminds us that while our brains are brilliant, they can also be stubborn know-it-alls, stuck in their own echo chambers. Enter the DREAM framework—not a sleep aid, but a recipe for real learning: Downtime, Recall, Effort, Attention, and Meaning. It's like a brain-friendly smoothie blended with neuroscience, psychology, and a dash of classroom chaos. The moral? If educators, scientists, and psychologists stop working in silos and start swapping notes, we might just teach our brains to play nice—and actually remember where we left our coffee."

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A former Head of School and Associate Dean (Learning & Teaching), Ken has guided educational reform affecting students and teachers through his longstanding work with the Queensland

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Judi and Ken regularly collaborate with neuroscientists, medical doctors, psychologists, and educationalists to ensure their work is evidence based and current.