AONA Pedagogical Framework

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Introduction

A pedagogical model is the theme and underpinning philosophy that drives the school's organisational practices, programs and processes. It helps educators make evidence based decisions when identifying and choosing strategies and programs. This pedagogical approach incorporates the following parts:

- The tenets: Underpinning understandings about the brain
- The pillars: The essential components of pedagogy
- The hallmarks of learning: Learn the dream is how we learn.
- The 7R's: The steps to engage the learner
- The teaching methodology: The brainwise teaching methodology (BTM)
- Thinking strategies: The teaching and learning tools

This pedagogical framework is evidence based and informed by a synthesis of the research in the field of neuroscience, education and psychology combining teaching and learning concepts from a variety of expert sources.

References

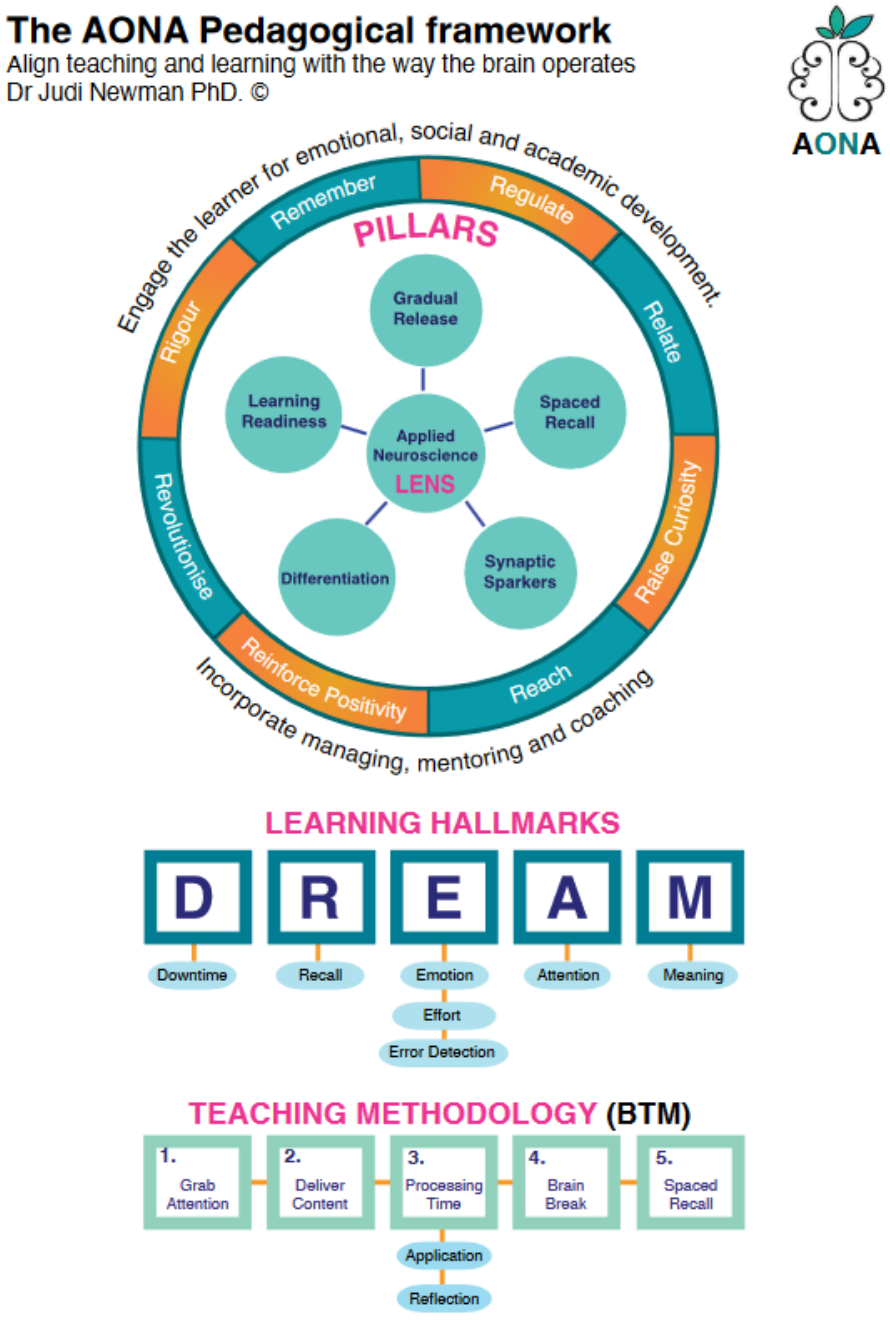
Dr Louis Cozolino,	The Social Brain
Dr John Hattie,	Visual Learning
Dr Robert Marzano,	Art and Science of Teaching
Douglas Fisher & Nancy Frey,	Gradual Release of Responsibility
Dr Jerome Bruner,	Scaffolded Instruction
Dr Carol Dweck,	Growth Mindset
Lev Vygotsky,	Zone of Proximal Development
Dr Amy Arsten,	Stress and Thinking
Francesco Cirillo,	The Pomodoro Technique
Dr Evian Gordon,	Integrated Neuroscience
Dr Bruce Perry,	The Neurosequential Model
Professor Ken Purnell,	Education and the Brain
Dr Judi Newman,	The Brain: Learning and leadership
Dr Paul Zac,	Memorable moment
Dr. Judy Willis,	Learning and Stress
Dr Stanislas Dehaene	How we learning and the Brain
Dr J Cacioppo	The Social Brain
Dr M Lieberman	The Social Brain
Dr N Eisenberger	The Social Brain
Dr D. Sousa	The Brain and Behaviour
Professor Dunbar	The Brain and relationships
Dr Rick Hansen	Neural Traits and States
Dr Barbara Oakley	How to learn
Dr Jared Cooney Horvath	Brain science and learning

Tenets

THE BRAIN		COMMON UNDERSTANDINGS
Brain 1: GUT INSTINCT Associated with the lower regions of the brain called the EMOTIONAL BRAIN. This part of the brain has a role in the physiological responses to stress, movement, breathing, arousal levels and survival. Key principle: The brain is hard wired to detect threat. We are judged by our TRUSTWORTHINESS Can I trust them and am I safe? Do I detect strength? What will I lose? Inspiring trust from teacher to student is the first port of call.	1.	The brain stem needs to be calm to process logical thought.
	2.	Stress inhibits cognition, creativity and memory.
	3.	Chronic negativity hampers synaptic connections.
	4.	Distrust is the default of the more primitive regions of the brain.
	5.	Survival memories are more powerful than sematic memories.
	6.	Survival thinking takes precedence over logical thinking during stress.
	7.	Emotion was our first language and instinctively emerges within a fifth of a second of an interaction.
	8.	Humans are easily triggered into agitate state by criticism and blame.
	9.	A learner is less anxious and tries harder for teachers they like.
	10.	Emotions are a critical part of the learning process as hey grab attention.
	11.	Mood is contagious.
	12.	Positive states create positive neural traits.
	13.	Our brain is a dopamine seeking machine.
	14.	Anything funny, unusual, unexpected, novel, dangerous, interesting, important and pleasurable will grab the brain's attention.
Brain 2: HEART FELT Associated with the limbic systems and called the SOCIAL BRAIN. This part of the brain has a role in how we feel such as pride, love, and loyalty and is associated with social bonding. Key principle: The brain evolved to operate and belong to a social group. We are judged by our WARMTH Did I feel a warm connection of acceptance? Are they from my tribe? Do I feel valued and understood?	15.	At a neural level, emotion and cognition are interrelated so feeling and thinking cannot be separated.
	16.	Connections to the tribe is essential for our well-being.
	17.	We have an instinctive desire to feel par of and loyal to one tribe.
	18.	Teachers can prime conversational chemistry by showing warmth.
	19.	Role modelling has an impact dure to mirror neurons.
	20.	We need to experience a feeling before we can own a behaviour change.
	21	There is only limited change in behaviour or learning without neuroplastic changes.
	22.	Humans have a tendency to bond and learn from people they trust and connect with.
	23.	A lack of social connection and chronic loneliness can reduce brain mass.
	24.	The human motivational triggers are essential physiological needs, connectedness, control, certainty, appreciation, pleasure, purpose, exactitude, and challenge.
	25.	The brain picks up on the tone of voice quickly and nonconsciously.

It is essential for teachers to establish rapport and build relationships.	26.	Human notice what we look like and how we sound first.
	27.	Trust and communication decline the larger the group.
	28.	The brain is hard wired to listen to stories.
Brain 3: HEAD LOGIC Associated with the prefrontal cortex and called the THINKING BRAIN. It has a role in learning, higher order thinking, logic, focus, problem solving, empathy, personality, regulating emotion and short term memory. key principle: We have an innate desire to learn and achieve. We are judged by our CREDIBILITY Are they competent? Are they a rational thinker and open to learning? What can I gain? Teachers are more likely to maximise growth once trust and rapport are established.	29.	Intelligence can grow when it is exercised.
	30.	Every brain is wired differently.
	31.	The brain needs down time to encode new memory.
	32.	Spaced recall consolidates memory.
	33.	Insights require five special conditions.
	34.	We have a short attention span.
	35.	Learning is highly context and state sensitive.
	36.	Use it or lose it.
	37.	Single talking uses less brain fuel.
	38.	Learning is not a possible activity; it is an effortful one.
	39.	When learners construct their own meaning, they learn what they come to understand.
	40.	Retention is strongest in the first and last minutes of a learning period.
	41.	The brain was not designed to process a continuous flow of new information.
	42.	The brain clumps similar repeated information together to save fuel.
	43.	Learning is developmental and experiential, not linear.
	44.	The brain thinks in expectation and looks for patterns.
	45.	Movement, nutrition, care and sleep impact on learning.
	46.	Interleave similar material to improve transfer.
	47.	Interleave different material to improve flexibility, innovation and performance.
	48.	Interleaving can prevent the brain from clumping data accidently.
	49.	It takes 30-60 times of repetition to change a habit.
	50.	We do not pay attention to boring or unimportant things.
	51.	We only remember what we pay attention to.
	52.	The brain requires downtime, recall, emotion, effort, error detection, attention, and meaning in regard to how we learn.
	53.	You have 30 seconds to grab the attention of the learner.

Figure 1: The AONA Pedagogical framework



Pillars

Using a neuroscience lens to maximise student outcomes has five key components called the pillars. (Newman, 2020):

1. **Spaced recall**: Transferring electrical and chemical messages in the brain into memory to consolidate learning takes time. This process requires exposure to the new learning over time with sleep in between. Every time we recall something we relearn it. Building in brain breaks and processing time is part of the learning process. Revisiting and repeating new learning across contexts and using a variety of modes of teaching is an effective application of spaced recall.

2. **Differentiation:** All brains are unique so learning needs to start at a level to connect with existing neural networks from prior leaning. Scaffolding, goal setting, choice, next step walls and measuring distanced travelled are all key components of differentiation.

3. **Learning readiness**: If the learner is not engaged and paying attention, not much learning takes place. Calming the brain stem, teaching students how to regulate their emotion, building motivation and confidence, and raising curiosity and dopamine levels will prepare the student for learning. Being learning ready infers that the wellbeing of the learner is just as important as the academic progress. Emotional and social wellbeing are key components of boosting learning uptake.

4. **Synaptic sparkers**: Metacognitive thinking skills (thinking about our thinking) are as important to strengthen as the content itself. The 13 brain strengths for learning, build stronger neural connections that make all other learning easier. Offering students, the opportunity for rich experiences to develop the whole child, builds grey matter that serves the developing brain well.

5. **Gradual release**: Setting the context at the start of a lesson with the learning intent and success criteria, followed by a gradual release of content through I do, We do, You do, and recalling the learning intent at the end of the lesson to provide feedback on the effectiveness of the learning that took place, all gradually build challenge and effortful learning.

Hallmarks of learning

What conditions are required for the neuroplastic changes to take place for long term memory consolidation? These factors have been captured in a framework called "Learn the Dream" (Newman, 2022). This is how we learn. Learning is closing the gap between what we know already and continually improving our mental maps. Mental maps are chains of neurons in the long term memory.

How do we learn? Learn the DREAM

1. **D**owntime	The brain requires an incubating period after learning, to encode the data. Encoding is about strengthening the neural connections, developing spines and dendrites. Downtime activities include VENN diagrams and other graphic organisers, peer tutoring, discussion, questioning, debate and journaling.
2. **R**ecall	Build in spaced recall over time. If you can't recall it, you haven't learnt it. Repetition with sleep in between is essential for the consolidation of learning.
3. **E**ffort	Learning is an effortful process, not a passive one. If you don't invest in effort, you don't generate spines, strengthen the neural connections and thicken myelin.
4. **E**motion	The learner needs to be engaged so curiosity and motivation needs to spike. Positive emotion soaks dendrites in the chemicals they need to grow. Make learning enjoyable to sustain interest. Experiential learning is impactful and promotes dopamine, serotonin and oxytocin, reducing cortisol.
5. **E**rror detection	Provide feedback to address the gap between our current brain maps and our new learning as we update and improve what we know and understand.
6. **A**pplication	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.
7. **A**ttention	You only remember what you pay attention to. Hook attention within 30 seconds by using a FUUNDIIP story or visual to create a compelling emotional response and sharp focus. This activates the locus coeruleus, releasing Noradrenaline. The RAS is drawn to anything funny, unusual, unexpected, novel, dangerous, important, interesting and pleasurable.
8. **M**eaning	If it is not meaningful it won't link to prior wiring and may be stored in a remote part of the brain which makes retrieval difficult. Make it relevant to the learner.

Reference: Dr Judi Newman, (2022)

Methodology

The brainwise teaching methodology (BTM)

A fundamental understanding of neuroplasticity of the brain is a key part of teaching and learning training. If teachers understand how the learner thinks, learns and remembers at the neural level, they are in a better position to make decisions about evidence-based teaching and learning strategies. A high yield teaching strategy is one that will strengthen neuron connections and consolidate memory, so it is more about choosing the most appropriate strategy for the concept being taught, and to align with the stage of the learning process taking place in the brain. The most successful teaching methodology for teaching complex new concepts is an explicit teaching method because concepts are broken down, there is a release of responsibility by the teacher building independent learning by the student and the teacher has more control in assessing what is happening in the learning uptake. A lesson can be divided into five components (Newman, 2022) to increase the likelihood of learning to be consolidated.

	Component	Detail
1	Grab attention	Use a compelling story or visual tap into the FUUNDIIP factors that build curiosity and focus. The RAS pays attention to anything that is funny, unusual, unexpected, novel, dangerous, important, interesting and pleasurable. The teacher has 30 seconds to hook the attention of the learner.
2	Teach	Teach the concept showing the big picture first. Use direct instruction**. I do: You watch.** Demonstrate and use exemplars if applicable. Use shared instruction. **I do. You help.** Teaching is what happens outside the learner's brain.
3	Learn	The brain requires processing time to encode. Use graphic organisors, metaphors and discussion to make meaning of the new learning so the brain can encode. Apply the new learning through problem solving and case study. Transfer knowledge to different contexts. Use reflection and error detection. Check for understanding. Learning is what happens inside the learner's brain. Use guided practice. **You do, I help**.
4	Brain Break	Provide an activity that is enjoyable but does not involve new learning to refuel the brain and reduce cognitive overload.
5	Spaced recall	Independent practice. **You do, I watch.** Rehearse and consolidate to memory over time. Use memory techniques and formative assessment.

We learn through experience

BTM is not lecturing. If managed well, the BTM is a powerful way of teaching, to improve learning uptake. The BTM is most effective for teaching new complex concepts, however there is a place for other teaching methodologies for different learning situations. Inquiry learning can be a powerful methodology that can be used with groups of highly motivated self-regulating students. In this method students tend to create their own meaning as they come to their own understandings. A university PhD thesis is a good example of this technique in practice. Additionally, cooperative learning, where the teacher works along side the learner in partnership is another option. In this method, the reliance of building strong relationships and networks across the learning groups and with outside experts, will support the learning journey. Experiential learning (learning by doing and applying to different contexts in real life) can be an important component of any of the above methodologies.

Calm, curious, and joyful classrooms

There is specific changing neural activity shown on brain fMRI scans associated with stress build-up that inhibits learning (Willis, 2006). When a learner is stressed, the brain is rewired to survival mode and their ability for higher order thinking in the prefrontal cortex (PFC) is compromised (Purnell, 2020; Willis, 2006). The PFC is where higher order thinking occurs such as problem solving, regulating of emotions, planning, empathy, reflection and critical thinking. Dr. Judy Willis explains that "prolonged stress correlates with increased density and speed of the neuron to neuron connections in the emotional part of our brain (Limbic system) that is reactive and corresponding decreasing connections in the PFC". Our emotional states change our neural pathways to create hard-wired traits. A teacher can reset the circuits, change brain chemistry and rewire the brain to access the PFC for optimum learning with positive experiences, calming the brain stem, achieving goals, and building positive relationships with the learner. Creating classrooms that build social and emotional capacity as well as academic capacity are more likely to achieve learning success. Preparing students to be learning ready with a growth mindset (Dweck, 2006) is as important as the learning itself. "With such evidence-based research, we can no longer think of joyful classrooms as an "excuse to coddle students' – if students are stressed out, the information cannot get in. This is a matter of science." (Judy Willis, 2016).

The eight steps to engage the learner (Newman, 2020) have been compiled to demonstrate the practical strategies and thinking underpinning brainwise classrooms. The brainwise classroom will involve the following concepts and they are not necessarily sequential in nature.

The eight steps to engage the learner

Regulate (Learning readiness)

- Calming techniques
- Active contribute response
- Routines and rituals
- Growth mindset
- Learning readiness
- Bunny and shark thoughts

Relate (Relational learning)

- Greeting routines
- Tribal rituals
- Sense of belonging
- Encouragement
- Inspirational walls
- Relational teaching
- Networking
- Collaborative learning

Raise curiosity (Interesting learning)

- Attention grabbers
- Learning goals
- Pose questions
- Problem solve
- Passion projects
- Emotional value
- Learning intent
- Success criteria
- Focus
- FUUNDIIP pig

Reach (Accessible learning)

- Normalise the leaning dip
- Dopamine makers
- Meaning and relevance
- Motivational triggers
- Storytelling, analogies and metaphors
- Wellbeing cab
- Choice
- Confidence builders
- Understanding the brain
- Connect to real life
- Start at level
- Experience rather than tell
- Minimise distractions
- Train focus
- Set goals

Reinforced positivity (Positive learning)

- Mood
- Positive framing

- Restorative practices
- Stories of hope
- Inviting settings
- Trauma informed practice
- Think twice about how you show up
- Motivational response model
- Reduce stress
- No labels

Revolutionise (Personalised learning)

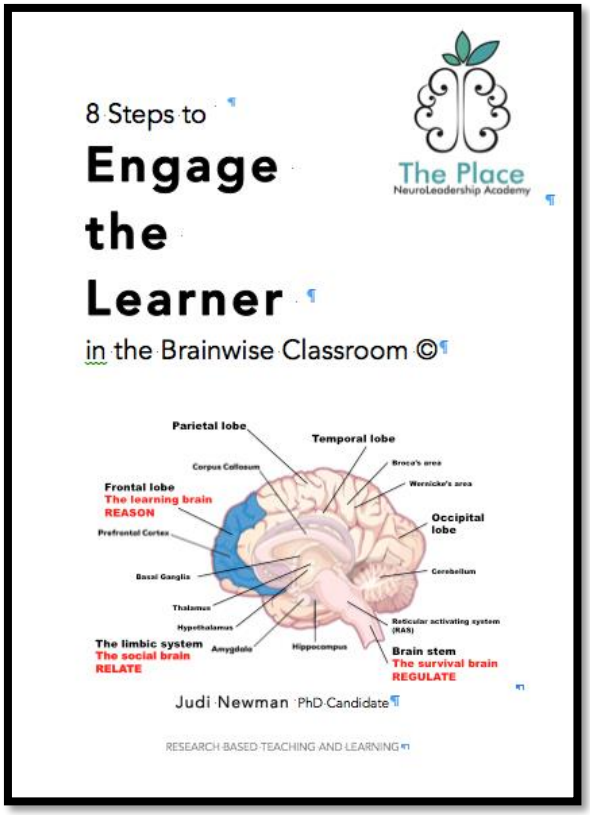
- Linking to prior learning
- Gradual release
- Differentiate
- Model
- Scaffolding
- Feedback
- Personalise
- Check for understanding
- Learning curve

Rigour (Challenging learning)

- Effortful learning
- Error detection
- Encoding strategies
- Apply to different contexts
- Processing time
- Problem solving and critical thinking
- Case studies
- Neuroplasticity
- Thinking levels
- Transfer
- Interleaving
- Synaptic sparkers
- Questions
- Metacognition
- Creativity and innovation
- Reflectivity
- Rich tasks

Remember (Consolidated learning)

- Repetition
- Spaced recall
- Test and recall
- Visualise and associate
- Cognitive overload reduction
- AVLAR the rabbit
- Chains of neural links
- Primacy and recency effect
- Brain breaks
- Pomodoros
- Chunking
- Visuals
- Processing time
- Survival memories
- Association
- Different modes of teaching
- Teaching others
- Peer tutoring

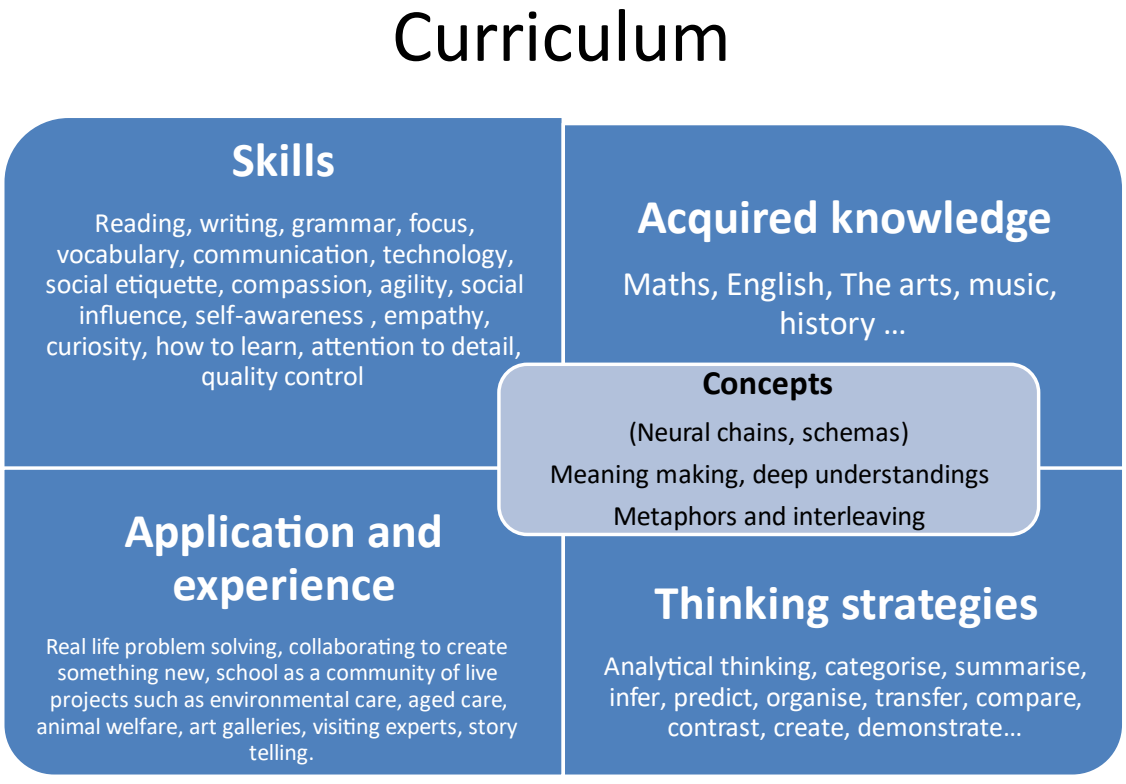


For more information about these concepts refer to the book “The Eights Steps to Engage the Learner in the Brain Wise Classroom by Dr Judi Newman

What does this mean for the curriculum?

The brain thinks in concepts, connecting data to what it already knows and encodes the data into neural chains to memory consolidation. The more neural chains (called schemas) the brain has stored the more connections can be made when learning something new therefore the less cognitive load you will feel and the faster your learning curve.

1. **Skills**: Reading, writing, grammar, vocabulary, focus, communication, empathy, technology, agility, social influence, how to learn…
2. **Acquired knowledge**: Literature, maths, history, art, music…
3. **Thinking strategies**: Analytical thinking, categorise, summarise, predict, infer, transfer, compare…
4. **Concepts**: Meaning making for neural chains (schemas) and mental maps for deep understanding and connections. Interleaving to improve performance and innovation.
5. **Experience**: Real life application including problem solving real challenges, collaborating in teams, creation of new ideas and insight. Make your school a vibrant learning reality. Make school real life (school newspaper, musical, band, market, orchid, art gallery, library, speaking corner, bank, choir, community projects and school council).

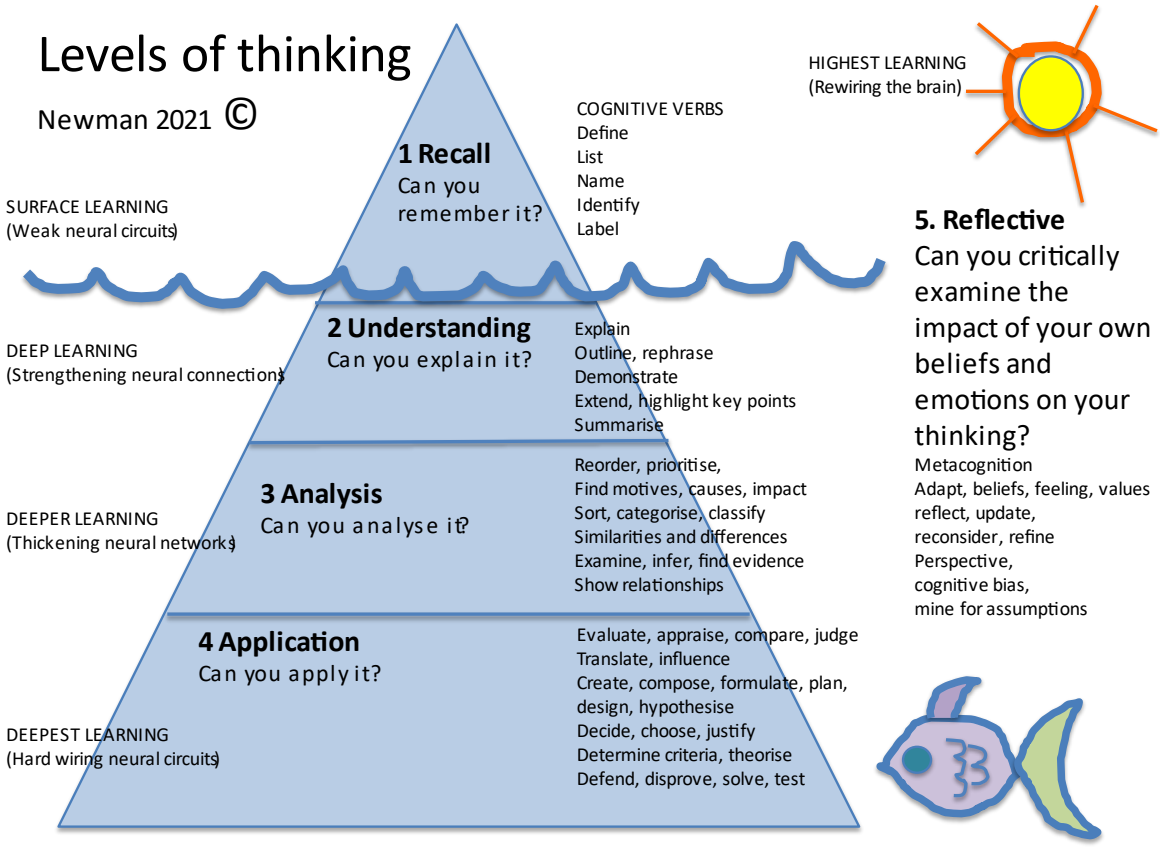


Thinking strategies

Thinking levels

There has been much written about higher order thinking skills and schools are very familiar with the new Blooms Taxonomy (Blooms, 2001). Neuroscience can add value to the importance of challenging the learner with deeper thinking skills by showing that there is another layer and that is, reflective thinking. The following model illustrates the thinking levels through a neuroscience lens.

Once the learner can recall the new learning, explain it, analyse it and apply it, the next step is to reflect on how their feelings, values, beliefs and cognitive bias impact on that new learning. (Although, not all learning has to be in this order) Why? -because it is the way we feel about something that will determine our willingness to engage and the way we feel impacts directly on our decision making (Kennedy, 2022, Zac, 2022).



For examples of questions for tasks and assessment with a high cognitive load, refer to the book “The eight steps to engage the learner by Dr. Judi Newman

Encoding strategies

Clumping	Story	Concept maps
Interleaving	Recall	Reading
Visualising	Scaffolding	Discussion
Associating	Graphic organisers	Questions
Acronyms	Journaling	Note taking
Analogy	Case study	Compare and contrast
Metaphor	Problem solving	Teaching

Are you learning ready?

The ESCAPE model captures our human needs which act as our motivational triggers. If the learner is finding it hard to concentrate or acting out, consider if there needs are being met. Are they hungry? Do they want attention? Are they avoiding the activity because they don't want to look silly?

Escape model

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AONA

E	**Essential**	A need for the basic comforts. Essential physiological needs such as, addressing thirst, hunger, pain, fresh air, sunshine, and exercise.
S	**Safety**	A need for physical and psychological safety and trustworthiness. This incorporates being mindful of fears and anxieties.
C	**Connectedness**	A need for warmth, rapport and like mindedness.
	Control	A need for choice and freedom.
	Challenge	A need for achievement, growth and self actualisation.
A	**Appreciation**	A need for status, self esteem and feeling valued.
P	**Pleasure**	A need for the things we enjoy.
	Purpose	A need for meaning and a reason.
E	**Exactitude**	A need for correctness. (fairness, truth, ethics, justice and honor).
	Expectation	A need for certainty and clarity.

The 10 human motivational triggers: Do people try to escape or engage?

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