●BRAIN SCIENCE

Things to keep in "**mind**" when teaching

We often learn about "How" to teach but not always "why" when we apply different methods and strategies. Here is some helpful information from the world of neuroscience.

→Interview with the author that inspired this infographic/study guide. Listen here!←

●**Neuroplasticity** is the way our brains can change, reorganize and rewire itself. Our brains are constantly making connections and forming new memories, and with it retaining these memories and forming them into knowledge. It is apart of how we learn! They can rewire themselves to function in unique ways. Adult neuroplasticity and some neuro-regeneration still happens. It is the most formable in childhood, however in adults it slows down. Yes you can teach an old dog new tricks! - just a little more effort to learn

The Basics (baby – adolescent)

Baby - middle year brains:

●Brain growth starts at 3 weeks gestation, 2 years it explodes in rate of development then starts pruning itself down. Pruning is the processes of the brain strengthening connections that are frequently used and "pruning" away ones that are weak and not used or underused. This creates faster more efficient pathways in the brain.

●ages 6-12 there is a special period where brains are primed for learning. This is the best time to teach skills (for example languages, sports, musical instruments) for the best natural fluency. The brain is extremely primed and ready to absorb information.

Adolescent brains:

●Brain is still developing and maturing, especially they frontal lobes and prefrontal cortex (emotional center of brain). Emotional capacity matures faster than logical reasoning capacity, so this may also contribute making them more irrational and react emotionally instead.

●Teen brains have low dopamine, which can also cause more reactive behavior. Dopamine is one of the neurotransmitters that do many things in the brain and body (controls conscious motor function and enhances pleasurable positive feelings in the brains reward system).
Example → eat cookie, get dopamine released, and receive a happy good feeling.

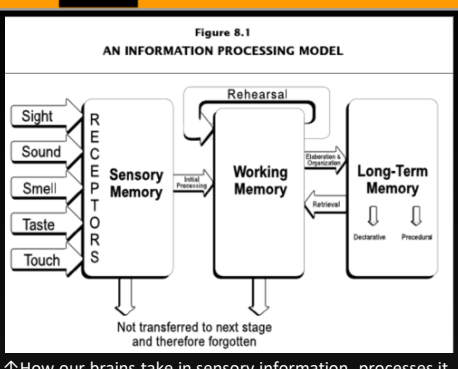
Important tips to remember:

●The role of play and activity in an interactive environment are extremely important for young child learning and development.

●Babies and young children need strong emotional attachments and socialization opportunities or if not, the dysfunction in creating and maintain relationships and attachment will carry out later in life.

● If not mastered during this time (age 6 – 12), the desired skills may never develop to that level. Linguistic, physical, emotional, academic, and social abilities need to be stimulated to grow. This is a perfect time for learning a new language or a musical instrument.

How we learn (memory process / types of memory)



↑How our brains take in sensory information, processes it, gives meaning, and stores it (figure 8.1 Brain Matters p.110)

Types of long-term memory	
Procedural memory	Declarative memory
-Describes skills, processes, and how we do things	-Refers to facts, experiences, and events.
-Unconscious memory	-Conscious memory

1. Simultaneous input of sensory information and all its contents and is taken in by the receptor areas.
2. Filtered for relevancy before moving to the next stage. To prevent an overload, the brain has to filter out non-relevant info.
3. It goes on to be stored in the working area until it's filtered and organized. All data except smell goes to the thalamus and then to the special areas (the cortexes) for processing.
4. Further meaning created by perception and pattern recognition and is sorted in the long term memory where learning occurs. During the process, working short term memory to long term memory, if it is not rehearsed enough or enough connections are made with previous connections, the information is forgotten. Needs enough meaning to get there.
5. Then in long term memory, information is stored.

What we can do (important concepts to use)

Based on the science, here are some things to consider

Build on prior knowledge. Emphasize concepts over individual facts – our brains seek patterns and connections and what we already know

Provide as much meaningful, real life contextual concrete learning experiences as possible and real world applications

Emotional events / experiences are remembered longer-Take advantage
Emotion→attention, attention →learning

Review/revisit previously learned info, it takes time and repetition to get stored in long term memory

The strategy used when presenting, practicing, reviewing matches the type of memory used for learning (declarative - procedural)

Safe environment for learning. Emotional vs. Rational: If psychological needs are met, then they can prioritize learning

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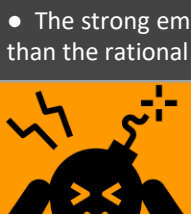
Important tips to remember:

● Use methods and strategies that activate as many parts of the brain at a time as possible, movement and all the senses – It will more likely be stored in memory and learned. Get their full attention.

● Use appropriate amounts of information at a time – chunking - because our brains can only store so much info in working memory at any one time.

● The strong emotional things go through our brain networks to the appropriate places much faster than the rational things, which take longer and have a longer ways to go in the brain to be processed.



Negative influences (Factors that can cause issues)

Many things outside of your control can affect student minds

●**Lack of sleep -** During sleep, information processing and memory formation happen as parts of the brain communicate. Two stages of sleep (REM and non-REM) for information processing and resetting minds. Neural connections are strengthened and our memory is stabilized as it moves from short term memory to long term memory. The learning process is also active when the brain is in sleep mode.
Not enough sleep can cause health issues, memory problems, and mental health.

Sleep = Teenagers → about 9 and a half hours / night Children → about 12 hours / night.

●**Poverty / Stress** – The negative effects of poverty and stress can de-prioritize student academic learning and wire the brain for survival mode. Can cause a range of behavioral, learning, emotional issues. Research ACE studies

●**Drugs / Addiction** – Drugs can mimic brain chemicals and wire brains to seek out behaviors that increase pleasure, like taking more drugs. Can change structure of the brain and student thinking.

●**Technology Use**-Repeated actions over time can also change wiring of the brain for addiction or focus and concentration issues. Can also cause sleep issues.

*Infographic/study guide by Danielle Le Sage

Wolfe, P. (2001). Brain matters: translating research into classroom practice. Association for Supervision and Curriculum Development. - Most images: free vectors
BrainWare Learning. (2016,December, 21). *Interview with Dr. Patricia Wolfe, Author of Brain Matters* [Video]. YouTube. https://www.youtube.com/watch?v=RGW2kgfv_cI