

TEACHER CHEAT SHEET: NEUROSCIENCE

MAKING APPLIED EDUCATIONAL NEUROSCIENCE
EASY TO TEACH

• **DESIGNED FOR THE "INSIDE OUT" CURRICULUM** •

PARTS OF THE BRAIN: PRE-FRONTAL CORTEX

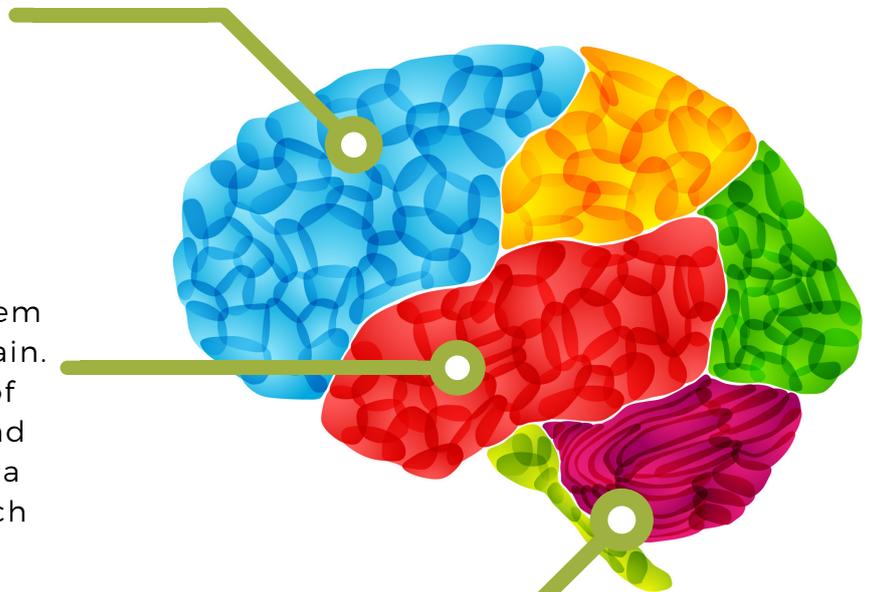
The pre-frontal cortex is the front-most portion of our brain and controls our logic, reasoning, decision making, and social behavior. This is the last portion of our brain to be developed, and many neuroscientists now claim that it continues to develop into our late twenties.

PARTS OF THE BRAIN: LIMBIC SYSTEM

The limbic system is a complex system made up of multiple parts of the brain. This is the system that is in charge of our basic emotions of fear, anger, and pleasure. This is where our amygdala and hypothalamus are located (which we will talk about later on).

PARTS OF THE BRAIN: BRAIN STEM/MIDBRAIN

This portion of the brain mainly functions to control our automatic and "primal functions", such as temperature regulation, our senses, heart rate, and breathing.



NEUROPLASTICITY

Our brains have the capacity to be changed at any point in our life due to the amazing concept of Neuroplasticity. This is basically synonymous with malleability, and is perfect to teach our students that we can always learn new things and change the way we think.

NEUROHORMONES

Neurohormones are quite literally the hormones found in our brains. Two major neurohormones to know for these lessons are Serotonin and Dopamine. They both do a lot for our bodies, but for these lessons it is important to know that Serotonin is a main contributor to our happiness and well-being, while Dopamine is largely responsible for our reward-motivated behaviors as humans.

MIRROR NEURONS

Mirror neurons are exactly as they sound: they are neurons in our brain that literally "mirror" the behaviors and emotions of others. These are responsible for us feeling sad when we see others crying and yawn when we see someone else yawn!

MYELIN

Myelin is the insulating sheath around an axon (two neurons that come together to make a neural connection, or a new "idea" we have learned). Every time that we "exercise" that neural connection another layer of myelin is wrapped around it, creating a myelin sheath. The more myelin we have around an axon, the stronger that connection is! This is why "practice makes perfect", because every time we practice something we are making that connection stronger, just like building muscle.

PRUNING

Pruning is another way to say "getting rid of". For these lesson plans, the need-to-know about pruning is that during the adolescent years our brains prune away about half of the neural connections that we have built since birth. There are many connections that our brain recognizes that we don't need anymore, so it gets rid of those to make room for the new ones we will make.

"INSIDE OUT" SPECIFIC

In the film "Inside Out", that inspired and connected our lessons, there are specific terms that they use to explain functions and phenomena in the brain. These two are specifically utilized in these lesson plans, so to help here are some definitions.

Core Memory: These are memories of extreme importance in one's life that contribute to an aspect of one's personality (i.e. Riley from the film has a core memory of the first time she played hockey, which contributed to her love of hockey).

Island of Personality: Stemming from core memories, these "Islands of Personality" are key aspects of one's personality (i.e. Riley has a "Hockey Island")

STRESS RESPONSE SYSTEM

This is what we widely know as the "Fight or Flight" Response. This is a complex response that starts with our eyes and ears- think of an oncoming car. When we see or hear the oncoming car, our eyes and ears send a signal to the amygdala, which processes the information. If it perceives a potential danger (as it would with an oncoming car), it will send a distress signal to the hypothalamus, which is the "command center" for many functions of the body, including our automatic functions (if you remember from the first page, are controlled by the brain stem). This will activate the "fight, flight, or freeze" response, which automatically increases your senses, heart rate, breathing, etc., to give you the best chance for survival. In the example of the oncoming car, this response would allow you to jump out of the way before even really thinking about it - if our body did not do this, our brains would send all of this information to the pre-frontal cortex (our "logical brain"), which would take a longer time to process the danger and reach safety.

In shorter terms: when our amygdala perceives a danger it sets the stress response system into motion, which in turn shuts off our pre-frontal cortex and elevates our automatic responses. This happens whether a danger is real or not: it is all about how our amygdala PERCEIVES it. This is why some of us feel the stress response system in situations such as public speaking or large public gatherings.



BRAIN REGULATION STRATEGIES

Since our Stress Response System can be activated without a real danger present, it is important for us and our students to be able to recognize when we are feeling this stress and know how to regulate. These brain regulation strategies can also be known as coping skills or focused attention practices.

Brain Regulation Strategies can be incorporated into daily classroom activities, and we recommend utilizing them in these lessons as you see fit. It is important for students to practice these strategies when they are not experiencing a stressful situation, as they are more likely to be functioning in their pre-frontal cortex and absorb the information. We also know that the more times students can practice these strategies, the more myelin will be coated in those connections so that when their stress response system IS activated they will be more likely to revert to one of the strategies that has a thick myelinated sheath.

Breath and movement are two of the best ways to regulate our brains- as long as you keep those in mind you can get creative with your strategies!

TWO OF OUR FAVORITES

Here are two of our favorite Brain Regulation Strategies to get you started.

Breath: Square Breathing (draw a square with your finger- while drawing left side breathe in for four counts; while drawing the top side hold your breath for four counts; while drawing the right side breathe out for four counts; while drawing the bottom side hold your breath out for four counts. Repeat at least three times).

Movement: Toes and Tense (While standing, slowly lift yourself up on your toes. While on your toes, feel your calves tense up- try to tense them even more and hold for ten seconds. Slowly release the tension and bring yourself down onto flat feet. Repeat at least three times).