

A Work in Progress

Why teenage brains need the best education they can get.

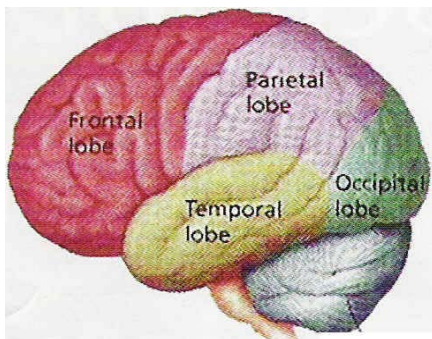
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Garuda In-Flight Magazine - March 2007

For many years, we have blamed the reckless irresponsible behavior of teenagers on raging hormones. However, recent research in neuroscience helps us to understand the erratic behavior of early adolescence when we take a closer look at what is happening inside teenagers' brains.

The Frontal Lobes

Two processes occur as the human brain develops - the production and growth of neurons, dendrites and synapses, or grey matter, and the process of pruning - destroying seldom or unused connections. Overproduction of neurons, due to the enormous growth that occurs in the brain during the first three years of life, has long led to an emphasis amongst many parents and educators to focus on the enrichment of the preschool brain. This emphasis has overshadowed another important opportunity that occurs in the brain during adolescence. While for hundreds of years we believed the brain was fully formed by early adolescence, we now know the brain is still malleable in both cognitive and emotional development during adolescence and even into early adulthood. The old "Use it or lose it" adage holds true during this time. Studies have revealed an overproduction of grey matter again during adolescence. This provides a chance for teens to excel in new areas. Teens therefore need to be involved in reading, writing, scientific experiments, and problem solving activities, as well as physical challenges, or the synapses of these activities will be pruned.

Pruning at this age allows the adolescent brain a more organized circuitry and thereby begins to refine higher-order thinking processes. Not all brains mature at the same rate however. Although we know the frontal lobes are busy making connections and are more ready to solve problems, often older students still require hands-on materials and activities to promote learning. In the words of H.T. Epstein when comparing teenage brains to computers, "we can expose teenagers to all the software we want, but until their 'hard drives' are upgraded, it will have minimal impact." In other words, not all teens develop the capacity for abstract thought at the same time.



The Temporal Lobes

Located below the frontal lobes on either side of the brain, just above the ears, the temporal lobes are associated with hearing, language and auditory memory. Researchers in UCLA imaged the temporal lobes of teens and found these lobes on the left and right sides of the brain did not complete growing grey matter and begin to be more fully connected until aged 16. This is the time when the brain's capability to communicate is increased. This explains the constant rollercoaster of emotions and the related difficulties with communication, where misunderstandings easily occur. Parents of teens have long known the abrupt, mean-spirited, sarcastic or even profane words that come out of teen's mouth. Here neuroscience can

help bridge an understanding of this communication gap. The answer is in the developing frontal lobes of the adolescent brain and the yet-to-be-finished connections between the frontal and temporal lobes.

All brains work via a constant feedback loop system. We all make or change our next move based on the feedback of what we just did. The brain rarely gets it right the first time and relies on that feedback to correct itself the next time around. Feedback is especially important during adolescence, as the brain is growing and building new connections as well as pruning synapses. If the brain gets no feedback, it has no reason to respond to information or learn. Feedback in the classroom and in life is vital in helping teens turn their brains into more efficient learning systems.

Teens and Stress

We may think teens have it made with nothing to complain about - they live rent-free, don't have to buy food and get to go to school and have fun. But life is stressful for them (just as stressful as for adults) because their brains are especially vulnerable to stress. This is because serotonin, the neurotransmitter that makes us feel peaceful and calm is at a natural low during adolescence. Serotonin not only helps to regulate our body temperature, blood pressure, digestion and sleep, but also acts as a calming agent. Feelings of anxiety, helplessness, despair, or depression can also easily build in the teen brain. With adolescent questions linked to moral development and self-perception, teens require a safe haven, a place of acceptance and recognition from people who can help them sort through their emotions.

As much as teens try to make it appear that they don't need adults in their life, the opposite is true. They have a strong need to interact with positive adult role models. At the same time, teens need their own space and sense of independence.

Maintaining such a balance, while providing the mental and physical stimuli to make the most of the brain's power is the key to providing a good well-rounded education.