

Understanding the Brain: Enhanced Learning for ALL!

By Richard M. Cash, Ed.D.

Margaret Mead, the cultural anthropologist stated in the 1940s, “We are now at a point where we must educate our children in what no one knew yesterday, and prepare our schools for what no one knows yet.” These are powerful words, even today. Schools tend not to be centered on learning for the future, but on learning for today. Massive amounts of testing (usually rote based information), and sub-standard standards (usually fact based) often do not lead children to think critically or at deeper levels. Knowing how the brain processes information and “thinks” can assist educators in raising the rote learning process to critical and creative thinking for “what no one knows yet.”

A Caution:

I am neither a brain scientist nor a scholar in the field of brain development. Though, I am a successful educator of children and adults with over 15 years experience working with the brain. Caution: Just because one works with a brain does not mean one knows about its development or functional processes. That is why I’ve committed many hours of study and practice in gaining a better understanding of the basics of brain development and structure. Having this understanding has given me a greater awareness of effective teaching strategies for meeting the needs of the learning brain.

Many authors in the field of brain learning, and brain development suggest that emotion drives attention, which drives learning (see Erlauer, Given, Jensen, Sprenger, & Wolfe). Without the correct emotional attachment to the information entering the brain, very little attention will be applied to this information to be processed at the higher levels.

Three levels of the brain

Simplistically, the brain can be divided into three “levels.” The lowest level, and the level through which all information must pass, is the brain stem or Reptilian Brain. It is called the Reptilian Brain because this portion of the brain is most responsible for fundamental and evolutionarily primitive processing functions. The brain stem is specifically responsible for controlling the bodies involuntary systems, such as breathing, heart rate, and blood pressure. This is also where the “fight or flight” response is located. Information coming into the brain deemed as most life threatening will be dealt with on the lowest most basic level. If information is considered non-life-threatening it is passed along to the emotional center of the brain.

The next level can be considered the emotional center of the brain. This is a highly complex area of compartments each coordinating various functions such as information collection and distribution (the thalamus) or “relay station” to other areas of the brain. The hippocampus (meaning seahorse) is the switchboard between short and long term memory and not completely developed until age 2 or 3. Another highly important component of the emotional level of the brain is the amygdala. The amygdala is the “emotional gate” to the higher-levels of the brain. Information passing through the amygdala is provided emotional capacity or attention.

The final and only conscious level of the brain is the neocortex. The neocortex or cognitive processor is responsible for all higher order thinking. Self-regulation, critical thinking, and awareness of thoughts and actions are all associated with the neocortex. In other words, information is synthesized from inner and outer sensory worlds.

Two types of Cells

Two types of cells make up the brain: Glial cells and neurons. Glial cells make up over 90% of the brain's cells. These cells provide nutrients to the neurons mainly in the form of water. These cells do reproduce.

Neurons, on the other hand, do not reproduce. You are born with a full compliment of neurons, approximately 100 billion! These cells are unique in that they do not reproduce, have a shape unlike any other cell, and most importantly can communicate with one another. Neurons are the basic functional unit of the nervous system. If neurons are not used they will be culled out of the brain's system. Damage to these cells or lack of use of these cells can limit access to information processing or storing.

Four Principles of Brain-based Learning:

Safe and non-threatening environment

Information entering the brain must pass through the lowest level of the brain to be processed at higher levels. If the information is clouded or stopped by external or internal stressors, it will be greatly inhibited from higher level processing. Students who come to school with less than perfect home lives, lack of proper nutritional care, suffering from fear caused by bullying or other torments, will find it relatively impossible to focus significant amounts of brainpower toward learning.

Ensuring that the school environment is safe and welcoming can alleviate some of the pressures students encounter in the learning process. Classrooms that are community oriented and respectful of individual differences make for a better learning environment. Teachers who genuinely care for each and every student, no matter what "baggage" the student may carry, will see greater student achievement.

Stimulating and varied input

Many times people use the analogy of relating the brain to a sponge. Actually the brain is far more similar to a sieve. The brain is constantly filtering out unnecessary or non-life threatening information. Think of the sounds of a fan on the overhead; after a while you no longer "hear" it. Instruction can have the same effect on the brain. When information is presented repeatedly in the same way, the brain will eventually tune it out.

To ensure information is processed and stored, find unique and interesting ways to deliver instruction. Videos, interactive lecture, guest speakers, hands on experiences are all effective ways for information to be delivered. Too much of any form can become routine. Keep instruction fresh and alive.

Active and meaningful learning

The brain is a highly complex set of interrelated networks. Information is processed and stored in multiple “compartments” through various pathways. The more actively a person engages in a learning activity the more complex paths the information takes to storage. Repeated use of neurons ensures easier and eventually automatic connections to long term memory. This automaticity or efficiency of neural functioning is an important aspect of intelligence. The speed of thinking and efficient use of “brain power” allows the brain to process information at higher levels with greater complexity.

Students who are provided active learning will more likely use multiple modes of manipulating information. Combining several of the five senses while teaching will allow students to more deeply imbed the information. Secondly, making the information meaningful to the student’s life will afford them different ways of storing and retrieving information.

Accurate feedback

The brain is designed to operate on feedback. Learning is simply the relatively permanent change in a behavior due to experience. Storage of information in the brain can happen instantly or over a longer period of time. If information is inaccurately processed with improper connections, retrieval and usage may be difficult. Making sure students understand and are able to relate the new information to other information will greatly increase the likelihood of long-term retention.

Feedback to students can be specific or non-specific. Editing of student writing or corrections made on a test would be considered specific feedback. Non-specific or general feedback would involve group interactions, or non-verbal exchanges. Feedback is usually most helpful when it is immediate, though some stressed or threatened children may prefer delayed feedback.

Applications

- Establish themes across curricular units for more meaningful learning. The brain does not learn in compartments—it learns holistically.
 - Connect complex and challenging information to real-life experiences for greater understanding.
 - Provide students the opportunities to choose what and how they learn. We all pay attention to those things for which we have an interest.
 - Use stories, myths, and metaphors when you teach. The brain loves episodic learning—we are more likely to remember those stories that are rich with detail and emotion.
 - Provide multi-sensory representations in learning and instructional activities.
- Learning styles are simply multiple ways the brain prefers to gather information. Giving students multiple options for learning will greatly increase long term storage.
- Consider the physical surroundings. Some people feel safer in quiet spaces; some feel more at ease when sitting by a window. Providing students a safe, welcoming and environmentally friendly atmosphere will permit the brain to think at higher levels.

- Develop a classroom/school community. We are social animals; we need other people to learn from and with. When students are accepted for their individual differences they feel more willing to take risks. Also, as a true community where everyone is cared for, learning becomes everyone's responsibility.
- Have students write reflectively everyday to reiterate and consolidate learning.
- Know your students. Understand their learning styles, ability levels, life/family background, interests, and likes/dislikes. The more you know about your students, the better prepared you can be in making learning meaningful.

Resources

The following resources have useful information and strategies for developing brain-compatible classrooms.

How the Brain Learns, Educational Leadership, November, 1998, Volume 56, No. 3

Given, B.K. (2002). *Teaching to the brain's natural learning systems*. ASCD. ISBN # 0-87120-569-6

Erlauer, L. (2003). *The brain-compatible classroom; Using what we know about learning to improve teaching*. ASCD. ISBN# 0-87120-748-6

Jensen, E. (1998). *Teaching with the brain in mind*. ASCD. ISBN #0-87120-299-9

Sprenger, M. (1999). *Learning & memory; The brain in action*. ASCD. ISBN # 0-87120-350-2

Wolfe, P. (2001). *Brain Matters; Translating research into classroom practice*. ASCD. ISBN # 0-87120-517-3