Brain Compatible Learning

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These are exciting times. In the last 15 years, researchers have learned about the brain and how it functions in exponential leaps and bounds. It's well past time to implement this knowledge into school curriculums. Interestingly, much of the methodology and philosophy of New Morning School supports brain compatible learning. Thirty-two years ago, we developed at a gut level what we felt worked best for children and how we thought they would learn best. There had been research prior to that time that we relied upon, but nothing like the wealth of technical information now available because of new sophisticated testing protocols and equipment.

Let's take a look at the tip of the iceberg of this new brain knowledge and how we apply it at New Morning School. Nummela Caine and Geoffrey Caine, in their new book *12 Brain/Mind Learning Principles in Action: The Fieldbook for Making Connections, Teaching, and the Human Brain*, outline 12 principles of brain-based learning. Their research is referenced in a book by Eric Jenson, *Introduction to Brain-Compatible Learning.* I'll use quotes from Jensen's book as they are presented in a more understandable form. In this article I'll discuss five principles, also citing from other authors, and relate this new research to activities occurring at New Morning School on a daily basis in all of our classrooms.

What follows is only part of the new knowledge we have about the brain and a snippet of the activities that occur at New Morning. Every day students are engaged in meaningful activity rather than rote tasks. Sense and meaning are key to their ability to learn new material, solve problems, and work together for a stronger result. All of what happens at New Morning School – all of the applications of this new brain research – results in a myriad of purposeful, daily activities by the children. The entire curriculum is greater than the individual parts; synergy happens at New Morning and creates young adults capable of leading, learning new information, and maintaining their excitement about learning.

EMOTIONS ARE CRITICAL TO LEARNING

Every book on brain research talks about the impact of stress and emotions on learning.

Research indicates:

- We know from current research that "emotions drive attention and attention drives learning" (written by Robert Sylvester, Wolfe, 2001).
- Feelings or strong emotions change attention and memory levels (Jensen, 1998).
- The old adage of keeping the emotions of the class in check or "having an even keel," is outdated. Positive emotions create an excitement and love of learning. They spur motivation to learn and tell us if we are confident (Jensen, 1998).

Applications to NMS Curriculum:

- Students learn best when their emotions are involved – fun, excitement, challenge.
- At New Morning students learn about the life cycle of a lizard as they watch Gex shed his skin.

- They learn about the difficulty Christopher Columbus had convincing the Royalty that he should make his journey when the "Queen," in full costume, rejects their request.
- Our youngest learn about the properties of snow, volume, and measurement when snow is placed inside in the sandbox.
- A debate in the middle school sparks interest and research into the pros and cons of social security.

IMPACT OF HIGH STRESS OR THREAT
Stress negatively impacts learning as the "fight or flight" response sets in.

Research indicates:
- Since the brain's priority is always survival, threat throws the brain into survival mode at the expense of developing higher-order thinking skills (Jensen, 1998).
- If . . . a teacher generates a classroom climate that is negative, students will develop anxiety about the situation and feel stress. The endorphins [chemicals released in a low-threat atmosphere] are now replaced by a steroid-like chemical called *cortisol*. . . cortisol alerts the body that stress is present. The brain shuts down higher-level processing (Sousa, 2003).

Applications to NMS Curriculum:
If students are under stress, learning will be relegated to second class. At New Morning, if a child comes to school upset that her pet Felix has died, the teachers will address that. This is necessary for optimal learning.

At New Morning, learning is a cooperative venture, not a competitive one where stress can be an outcome. Two students work together studying about lizards, consuming all that they are learning. At the elementary level, there are no tests; learning happens of its own accord in a relaxed, exciting atmosphere.

DEVELOPMENTAL STAGES OF READINESS
Read below for information on the opportune "windows" for learning specific skills.

Research indicates:
Ages 4-7
[During this period], the right cerebral hemisphere is developing more rapidly than the left. This means that most children are better kinesthetically. They are spontaneous, use a lot of emotion, and are usually quite good at imagining . . .

Ages 7-9
… We see more development in the left cerebral hemisphere. Now, language skills are better… Students become more aware of the details; whereas earlier, they were seeing more of the "big picture" (Sprenger, 2002).

Ages 1-10
This is the best time (ages 1-10) for foreign language learning . . . After age 10, the brain "self-prunes" and many neurons (brain cells) dedicated for language are reallocated or absorbed back into the system (Jensen, 1998).

Adolescence
When beginning adolescence, boys may be over emotional and over reactive due to the size and sensitivity of the emotional structure, the amygdale. Girls, who may have easier times remembering factual information, could also be struggling with their body images as their appetites increase . . .

The prefrontal cortex is the area of the cerebrum that controls the amygdale. It has not yet fully developed and may not do so until these students are in their 20s. Consequently, the brain structure that could help these young adults deal with their problems may not be physically able to do so. They may not be able to handle the higher-order thinking that we assume they can. (Sprenger, 2002)

Applications to NMS Curriculum:
Ages 4-7

- Children at this age need to move. They move as they enjoy finger plays, teaching language development and memory.
- There's action in the fish pond game as children match initial consonants with corresponding pictures.
- Students explore various roles, practice conflict resolution, and stretch their imagination as they plan and perform a play together about dancing, families, and fairies.

Ages 7-9
Mastering written and spoken language is an exciting period of exploration at New Morning. A student writes in his journal about tornadoes or earthquakes, trying to make sense of these powerful events, all the while learning sentence structure, grammar, phonics, and spelling.

Ages 1-10
Our students, as young as three and more formally at age six, begin to learn Spanish in a concrete way – naming play food, practicing a skit about meeting a new person, and playing hangman with new vocabulary. All of these activities take advantage of this window of opportunity for learning.

Adolescence
Our middle school is a time of exploration, acceptance, and support. This is a period where children are growing so quickly that their physical, emotional, and learning levels don't always match up.

The teachers' job is to challenge, yet support these students. They sometimes need help from the teacher to provide the tools and framework to solve a problem with their peers. It's a mistake on our part if we assume they have the thought structures in place to do this.

THE BRAIN IS MEANING-DRIVEN
Meaning is more important to the brain than information.

Research indicates:

Two factors strongly influence whether the brain initially attends to arriving information and whether this attention will be sustained. These two factors are meaning and emotion, and we have some control over these . . .

The brain may attend to meaningless information for a short time because it is novel; but if it can make no sense out of the incoming stimuli, the brain will probably not process them further (Wolfe, 2001).

Applications to NMS Curriculum:
Here are some examples of helping students attach sense and meaning to new information, resulting in more efficient storage in long-term memory. Every week a small group of elementary students do something called Pizza Math. They compile real pizza orders from their peers using real money. The team makes change, tallies the orders and compiles the composite order. On Friday they serve the orders to their friends. Suddenly math, counting money, and making change come to life. *There is a real purpose in learning and practicing these skills and in doing them 100% correctly. Otherwise, their peers may not get the correct pizza order the next day!*

The middle school students create individual PowerPoint presentations about Sumer, Persia and other ancient civilizations. They will present them to the class when they are completed. Suddenly there is sense and meaning attached to learning new software. They are not learning PowerPoint in isolation; they have researched their topics and need to know the tricks of this powerful tool to present their ideas most effectively.

THE NATURE OF ENRICHMENT
The brain can grow new connections at any age. Complex, challenging experiences with feedback are best.

Research indicates:
Every bit of evidence available in cognitive psychology suggests that the human brain is designed for thinking at many different levels of complexity. So if the brain is capable of higher-order thinking, why do we see so little of it in the normal course of student discussion and performance?

The reasons our students are not thinking critically is that we have not exposed them consistently to models or situations in schools that require them to do so. Schooling, for the most part, demands little more than convergent thinking (Sousa, 2003).

The brain does have “elastic” qualities. It changes physically depending on experience. The effects of enrichment may include more dendrites per neuron, more synapses per neuron, an increase in neural activity, an increase in tissue volume, greater density of capillaries, and greater blood flow . . . The more you learn, the more you physically change your brain (Jensen, 1998).

Applications to NMS Curriculum:
Wow! We have our work cut out for us! In schools everywhere, we need to challenge children, expose them to new information, and pose problems for them to solve. Here are a few examples:

Students, in teams, design the perfect container for dropping an egg from the roof. The goal – no scrambled eggs. This activity calls on teamwork, an engineering eye, and trial and error – a powerful learning tool.

In a summer science class, students encounter *Super Sleuths*. Their mission? Learn about thread comparison tests, chroma-tography, pH tests, fingerprint techniques and more. Then *apply* that knowledge to solve the crime.

Junkyard Wars: Middle school students, again using teamwork, use raw materials (which they must purchase on a budget) to build a rocket that will fly the longest. Later, they try out their assumptions and launch the rockets.

Our preschool and primary students, at the Discovery Table (a potpourri of science and math activities, one each day), construct simple graphs of the colors different children like, and compare hard, soft and other textures.

Conclusion

If we are to meet our students' learning and emotional needs, we must be aware of the impact of stress on learning, that children grow through predictable developmental stages, and that children learn best in a challenging and enriched environment. Most of all, children need to be excited and involved in hands-on activities for learning to be optimized. These are important lessons for our nation's educational leaders.

Brain Compatible Learning Article Sources

Caine, Renate Nummela and Geoffrey Caine. (1991). *Making Connections; Teaching and the Human Brain.* Alexandria, VA: Association for Supervision and Curriculum Development.

Jensen, Eric. (1998). *Introduction to Brain-Compatible Learning.* San Diego, CA: The Brain Store.

Sprenger, Marilee. (2002). *Becoming a "Wiz" at Brain-Based Teaching*. Thousand Oaks, CA: Corwin Press, Inc.

Sousa, David A. (2003). *The Leadership Brain: How to Lead Today's Schools More Effectively.* Thousand Oaks, CA: Corwin Press, Inc.

Wolfe, Patricia. (2001). *Brain Matters: Translating Research into Classroom Practice.* Alexandria, VA: Association for Supervision and Curriculum Development.