

Dedication

This book is for my father, George W. Karges, Sr. Though this book is about differentiation and differences, I can safely say that for Senior Master Sergeant Karges, there is only one way - “Dad’s Way”. Growing up as part of the Karges Family Air Command, with Big George in charge, I learned discipline and determination. Perhaps that has taken me further than anything else. Thank you.

Message

“The **teaching** of your word gives light, so even the simple can understand.” Psalm 119. Good teaching is simple yet powerful. It brings light to the dark places in a student’s brain, allowing him or her to feel confident and curious. It breaks down the barriers and makes the pathways straight. “You crown the year with a bountiful harvest; even the hard **pathways** overflow with abundance.” Psalm 65. When the learning pathways are *differentiated*, abundant learning is possible.

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chapter **ONE**

Brain Basics and Sensory-Rich Teaching

To fully appreciate the reasons for considering color, scent, foods, textures, movement, and music as important elements of your teaching repertoire, you must first understand the relationship between the pre-frontal cortex and limbic system.

Think of the limbic system at the back of the brain as a filtering system. Imagine the dryer filter catching lint, only it is a brain system catching emotions and senses. The limbic system captures emotional and sensory experiences, such as classical music playing while a student is doing math problems or a child tracing the alphabet in chilled menthol shaving cream. The entire experience travels to the pre-frontal cortex, or gray matter, in the front of the brain. This is where thinking and reasoning dwell.

It seems that a cognitive connection that is “scented” or “colored” or paired with some sort of emotional or sensory experience is stronger and more meaningful. This may actually have two rationales. Perhaps the reduction in stress that occurs in the presence of sensory experiences such as aromatherapy, color therapy or music therapy enables robust functioning of the gray matter. Maybe the simple pairing of cognitive and emotional experiences is a “double bond,” harder and more resilient.



The Banana Theory of Language and Learning

In addition to the multi-faceted relationships between front and back brain, teachers should consider the importance of timing and learning. I like to use the “banana metaphor.” Remember this:

- We are all the smartest (potentially) around age two, with 15,000 synapses per neuron.
- Until around age nine, when neural pruning takes place, the brain is ready and willing to learn and learn with ease. We call this a “critical period” or “window of opportunity,” depending on which theorist one reads.



Pretend that you are teaching in a site where many of the students were socially, emotionally, and cognitively deprived during critical periods. They missed major chunks of potential learning time, especially in language acquisition. How difficult is it to teach these youngsters?

Let's say that you bought a bunch of perfectly ripe bananas to make a simple fruit salad. Unfortunately, something interferes with the plan and the bananas sit on the counter for a week, becoming soft, bruised, and mottled. They are no longer candidates for fruit salad. So, what do you do? Toss them? No way. You make banana bread. Adding sugar, eggs, butter, flour, nuts, and spices takes more time, resources, and energy. But you have no choice. The bananas cannot go to waste.

So it goes with teaching at-risk children or those who have what Dr. Eric Jensen calls “fragile brains.” These youngsters missed critical periods. Some researchers at Baylor University contend that children who grow up in deprived environments may actually have 25% or less actual brain mass to work with. These students are candidates for banana bread.

Without rich, targeted, brain-friendly teaching involving all the senses, teachers will have little hope of creating new neural connections once the critical periods have been breached. This book, at one level, is a long recipe for banana bread for the brain!

What's the Problem With Pruning?

Why is neural pruning such a threat to a child's brain? After all, in nature, pruning flowers makes way for more beautiful blooms.

It appears that what's good for blossoms may not be good for babies. To understand, take a look at a number story. Number a sheet of paper from 1 to 3. Then, add the following information next to each number:

1. NCLB = Third Grade
2. Age 9 = Pruning
3. 4th grade = Prison

There is a relationship among these variables. Do you recognize it? The story goes like this...

The *No Child Left Behind* (NCLB) legislation sets the stage for all children to read proficiently on grade level by the end of the third grade. There is a strong neurological precedent for that decision. You see...

Around age 9, neural pruning of un-stimulated pathways begins in earnest, suggesting that children who cannot read proficiently by that time may never do so. Hence...

There is a dangerous connection between these two variables and the fact that the average reading level of U.S. prison inmates is around 4th grade². Children who cannot read proficiently enter adulthood at risk for many problems, including abuse, poverty, poor health, and even criminal activity.

How does this destructive cycle progress? Blame it on the pruning process. Neural pruning is just what it sounds like, the severing or removal of pathways that have not been hard-wired by stimulation or use. Learning to read is a critical task that the brain seems primed to undertake during early childhood. Moreover, there is substantial weight to the idea that language experiences during the 0-3 year period of human development are more predictive of later reading ability than one might imagine. Every word that a child hears during the early weeks, months, and years begets more rich language pathways. As brain buffs like to say, "neurons that wire together, fire together, and neurons that fire together, wire together."

The need for sensational brain-based teaching, then, seems imperative. Accessibility to rich, differentiated teaching in time to wire and fire the right neurons together! The scientific piece seems clear enough. The brain, schema, cognition, meta-cognition—all of this will be discussed thoroughly in the text. But what about the artistic side of teaching? Isn't a medical model such as "Brain-Framing" clinical, not aesthetic in its perspective? To pull it all together, consider this quote by Dr. Gerald Edelman, a Nobel-Prize laureate:

If we take the pre-frontal cortex and smooth out the convolutions, it is about the size of a linen dinner napkin. But if we begin to count the synapses or neural connections at the rate of one per second, we would finish 32 million years after we began³.

Think of all the connections that we aren't making for so many children! How can teachers harness the opulent, fertile, previously unharnessed resources to make these connections?

²U.S. Department of Education, "Start Early, Finish Strong: How to Help Every Child Become a Reader," Executive Summary, <http://www.ed.gov/pubs/startearly/execsum.html>

³Edelman, G. *Bright Air, Brilliant Fire: On the Matter of the Mind*. New York: Basic Books, 1993.