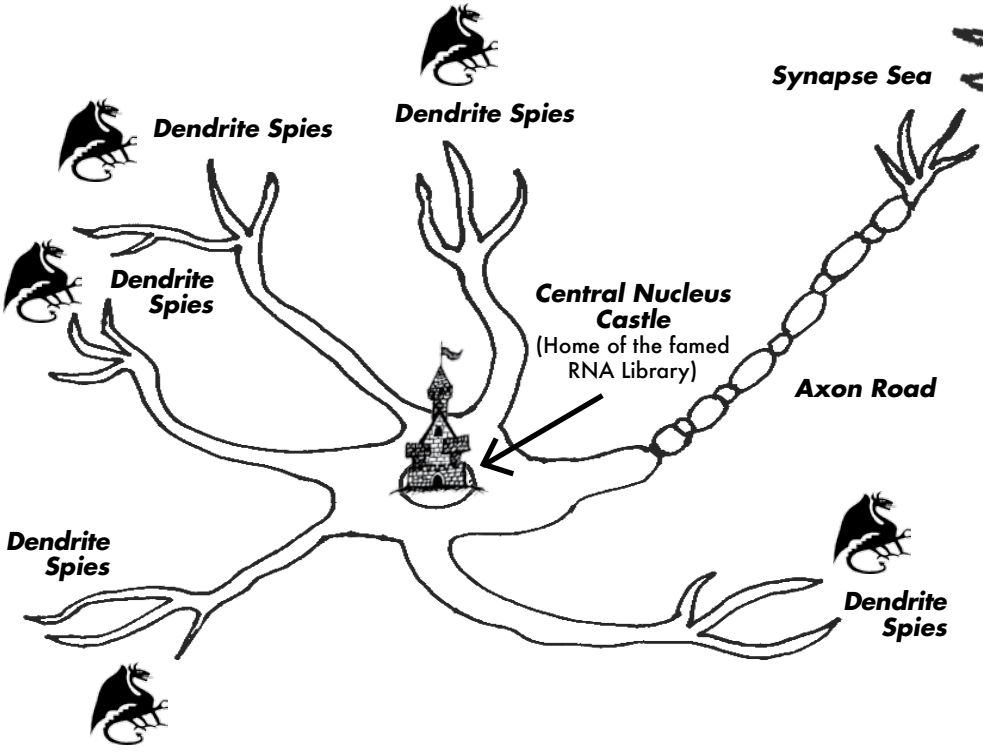

Brain-Based Learning
on Arts-Based Platforms
RICH
Learning
Dr. Rich Melheim


Dendrite Spies
Dendrite Spies
Synapse Sea
Dendrite Spies
Dendrite Spies
Central Nucleus Castle
(Home of the famed RNA Library)
Axon Road
Dendrite Spies
Dendrite Spies

It be-ith a sleepy morning in Ye Old KINGDOM of NERVE.

Not much happeneth until a message doth arrive from across the Synapse Sea to a lone Dendrite Spy Outpost, causing one solitary Dendrite Spy to payeth attention...

Ring, ring!

Zzzzzzz...

Ring, ring!

Zzzzz...

Ring, ring!

Huh? What is it?

Important incoming message from across the Synapse Sea. Better pass it on to Central Nucleus Castle!

(Yawn) Yeah... no. I'm going back to sleep.

Ring, ring!

Zzzzz... Huh? What already?

This could be important!

The ears. Lotta chatter out there.

What's the source?

Chatter? It's all chatter. Call me back when you have something more. (click)

Ring, ring! Ring, ring! Ring, ring! Ring, ring! Ring, ring! Ring, ring! Ring, ring!

Ring, ring!

WHAT?

Okay. We got the eyes and the ears and the sense of smell all registering this as something Central Command will want to know right now!

You got the eyes?

Aye. And you know what they say, "The eyes have it!"

Alright already, I'll pass the message on.

Milliseconds later, the message doth arrive at

CENTRAL NUCLEUS CASTLE

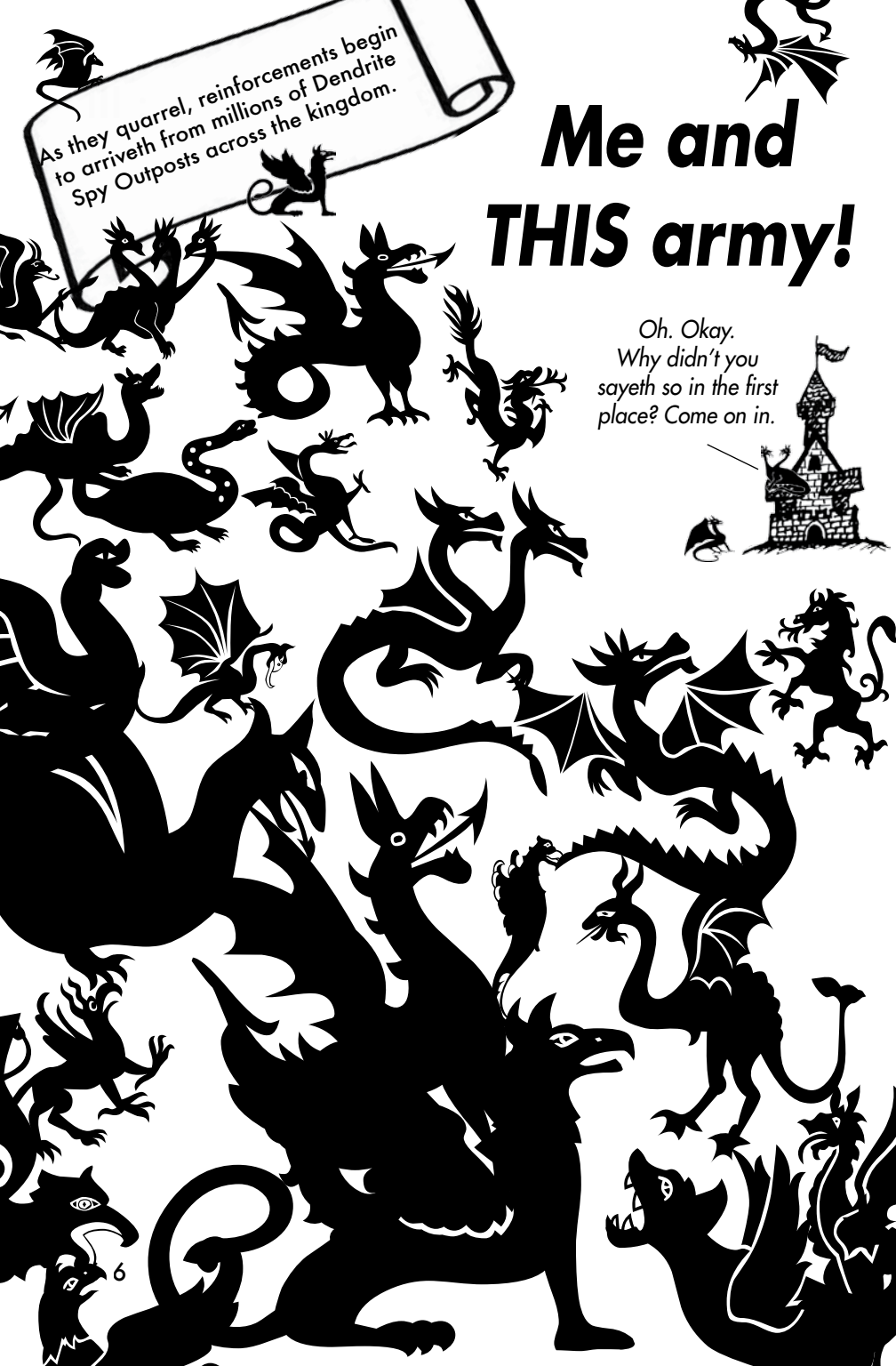
Bang, bang!

Let me in! Let me in!

Not by the hair of my chinneth chin chin.

Message from the front. Looks important. If you don't let me in I'm going to bust these doors down!

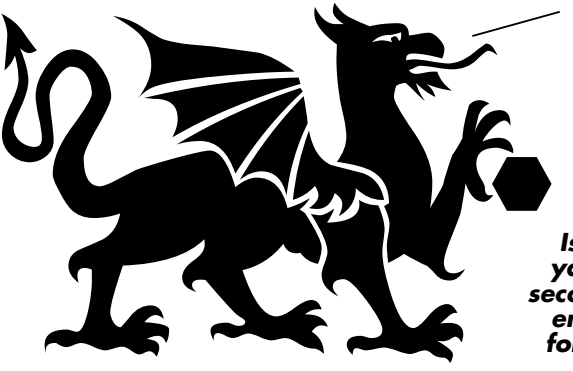
Oh yeah? You and whose army?


As they quarrel, reinforcements begin to arriveth from millions of Dendrite Spy Outposts across the kingdom.
Me and THIS army!
Oh. Okay. Why didn't you sayeth so in the first place? Come on in.

The message is taken instantly through the gates of Central Nucleus Castle, where the brilliant and ancient RNA Librarian decodes it, recodes it, and...

RICH Learning

Sendeth this immediately on down Axon Road to Synapse Sea and off to our neighboring allies! Forthwith. High hence be gone away!



Is 100 yards a second fast enough for you?

Milliseconds later, the coded message flies down Axon Road, arrives at the shores of the Synapse Sea, is loaded onto little boats in little bags. Once at sea, servants immediately dumpeth the contents, which floateth across the open space and arriveth at millions of lone Dendrite Spy Outposts on the shores of 10,000 neighboring kingdoms where...

Ring, ring!

Zzzzzzz...

Ring, ring!

Ring, ring!

Zzzzzzz...

Ring, ring!

Ring, ring!

Ring, ring!

Zzzzz....Huh? What is it?

YOU GETTETH THE PICTURE?
HERE ENDETH THE STORY AND
BEGINNETH THE BOOK OF...

RICH Learning

The Brilliant Neurology and Crazy-Effective Fun of Brain-Based Learning on Arts-Based Platforms

Dr. Rich Melheim

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To my "special class" reading teacher
who I don't remember but I'll never forget
because she didn't make me feel stupid
just because I couldn't read.

Out loud.

Contents


Let's
begin!

Recognize.
Identify.
Comprehend.
Harness.

That's RICH Learning in a nut shell. There. Now you don't have to read the book. You've got it. Put it down and walk away.

Okay. Maybe not.

RICH Learning is a no-brainer for anyone who doesn't have an extra nickel to spend on education but desires to enlist the most valuable tools of all: tools that light the human brain on fire and spark curiosity, joy and a life-long love of learning. It is a no-brainer for anyone who wants kids to be both more attentive and more retentive. It is an approach to education that embraces the arts at the core of all learning. At the core of all learning. Did I mention arts at the core of all learning?

Dr

I will begin with a neurological argument for the use of music, movement/dance, theater/play and visual arts as the **optimal** strategy for engaging brains – young and old. To bolster this argument, I will then offer a quick crash course on the molecular, cellular, and structural basis of memory and meaning-making in the human brain. I will next explain my own reading disability and the quest it sent me on – across the country and across the globe – to understand the neurology of reading and,

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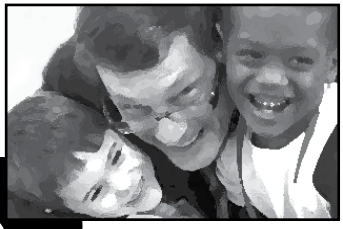

r. Rich

eventually, the optimal systems to employ for teaching anything to anyone. By the time you are finished with this, you will see applications from preschools to Alzheimer's units.

I will conclude with a case for including the arts at the core of all education, beginning as early as possible. As early as possible. Did I mention as early as possible? See if you don't agree. Even a poor child can have a rich learning experience if you simply:

- **Teach** the way the young brain learns best
- **Employ** the tools the young child loves most
- **Engage** primary care-givers every night in every home
- **Leverage** the best technologies available as teaching assistants, and
- **Train** and pay teachers at a higher level

How are we going to pull this off ? Allow me to give you a hint...

Once the music kicks in
little feet leave the floor.
Kids start dancing,
Jumping, prancing,
laughing, spelling,
learning, yelling,
bodies bumping,
hearts a-pumping!
Who could ask for more?

- More **oxygen** – to make the brain more attentive.
- More **glucose** – to make the brain more retentive.
- More **brain fertilizer**. (Google BDNF.) This magic elixir and memory fixer is a nerve enhancer that courses through the body when you move, move, move. It super-charges your blood to build more neurons in the brain and body, more connections in the neurons in the brain and body, and more receptors on the connections in the neurons in the brain and body.

More oxygen. More glucose.
More BDNF. And one more thing.

Less stress.

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Cortisol – the stress hormone – is sopped up when you exercise. This bad stuff constricts blood vessels and restricts the flow of oxygen, glucose and BDNF to the brain. So get up. Get moving. And get rid of it.

Then water up! Lungs, which are made mostly of water, tend to dehydrate and need water to absorb more oxygen. Now your brain is ready to learn. Grab the books, quick! You have about 20-25 minutes with the brain at **maximum** alertness and learning ability before the neurochemicals wear off and… it's time to jump up, sing and dance all over again!

**Photos from Dr. Rich's second set of living lab tests in Chennai, India. See more at www.richlearning.com.*

I.

Introduction: RICH Learning and the Young Brain

"If the child is not learning the way you are teaching, then you must teach in the way the child learns."

Rita Dunn

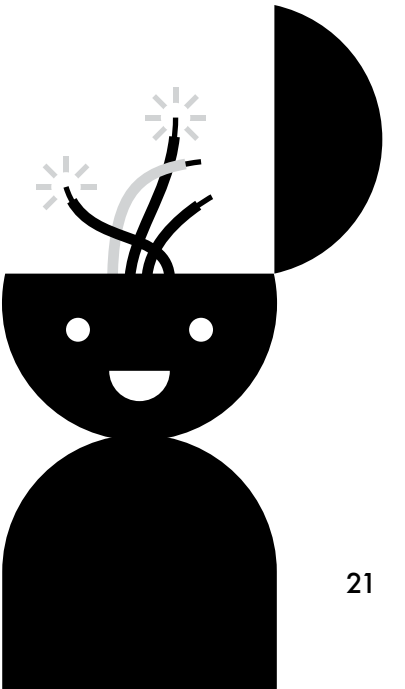
Over the last 50 years, technologies have not only transformed the delivery systems for information; they have also transformed how we learn, what we learn, when we learn, where we learn, why we learn and how we recognize, identify, comprehend and harness new information.

Nicholas Carr, in his provoking book The Shallows: What the Internet is Doing to our Brains,[2] argues that the Sumerian writing system, the printing press, the radio, the television – each new technology humans have employed en masse – has literally changed the structures of our brains:

"Media work their magic, or their mischief, on the nervous system, itself."[3]

Each successive media we embrace has literally rewired the circuitry inside our heads. To misquote Winston Churchill:

"We shape our technologies; thereafter they shape us."



I :

Flannel-Graph Teacher in a TGIF World

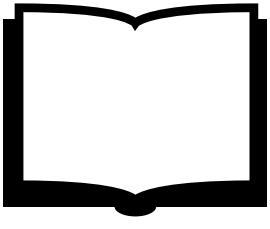
2005 was a watershed year in the history of human technology. Across the globe it came and went without much notice in educational circles. Among First World teenagers, it marked the year that raw time spent on television was surpassed by raw time spent on the Internet. For all practical purposes, the television era ended and the Internet era began. My doctoral mentor, Leonard Sweet, refers to this as the TGIF [4] (Twitter, Google, iPhone, Facebook) Era.

The netzeins of this brave new jungle are a different breed than those of the oral, book, radio and television generations that came before them. They will not sit passively in a desk and watch your "show." For this entire generation, one might argue the show is over. The show is over.

Did I mention the show is over?

This generation has little patience and zero interest in parking in a chair to absorb a one-way stream of information being taught, presented or preached at them. They require a much more involving,

Gutenberg Era:1440+



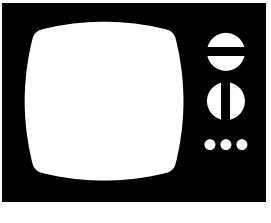
engaging and interactive learning environment or they won't stick around. Or, more properly, they'll sit there in the chair, but their hearts and minds will be off in a galaxy far, far away. The unspoken new mantra is this:

"If I'm not engaged in the conversation… I'm out of here!"

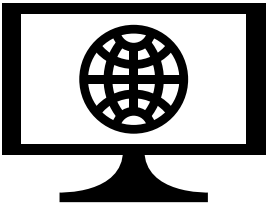
The lights will be on, but no one will be home. Sadly, when it comes to education, most of our schools have yet to enter the television era even though most of our youth have already left it.

To breach the cyber wall and reach this new mind, a change in educational philosophy and practice is slowly being implemented in some more progressive classrooms around the world. But for the most part, this tectonic rewiring of young changing brains has yet to be understood, embraced or even acknowledged. Most of our classrooms from kindergarten to grad school continue to live with old models, old methods, old technologies – or no technologies at all – and an Old World understanding

Television Era:1960+



TGIF Era: 2005+



of what good teaching, proper classroom management, and effective education looks like.

Changing Brains, Changing Approaches

Methods, models and materials that may have worked for teaching the Gutenbergers are proving woefully inadequate for reaching the Googlebergers. Educating this post-Gutenberg/post-television/ neo-Google brain will require dreaming, scheming, testing and tweaking new approaches. New strategies. New technologies and talk-knowledgies.

The one-way information exchange and social contract that traveled from professor to student in lecture halls of the Gutenberg World ("Sit still while I instill") and from blinking screens to couch potatoes in the more recent television

world ("I will deliver entertaining information for 7 ½ minutes as you watch passively and listen") must give way to richer and more varied interactive teaching approaches if it is to work in the TGIF world. But where do we start?

Fortunately, recent tools for discovering the world **inside** our heads have made learning about learning much clearer and more comprehensible today. Through the advent of precise brain-scanning tools – particularly fMRI and PET Scans – we have learned more about the human brain in the last five years than we have learned in the previous 5,000 years. Thanks to these new tools, we are now able to watch the learning brain light up, grow, change, and think in real time. With these new technologies and tools in hand, education itself has been given a powerful new gift: a window into the learning brain.

What new technologies and tools appear to be **most effective** for maximizing attention, retention, teaching and reaching the Googlebergers? Which methods, models and media might we manipulate to capture the minds and hearts of the tech-savvy denizens of this new Internet jungle?

I'd like to suggest a brand new set of brain-enriching tools and technologies at the core of all education, starting as young as possible. What might these radical new tools and techs be?

The Arts

How's that for new?

?

How's

Yes, the arts. It's that simple.
And it's that complex.
Bear with me as I begin with a brief look at the neurology of learning, itself, and move on to the crazy-effective fun you are going to have educating the post-Gutenberg/neo-Google generation when you begin designing and implementing brain-based

Brain-based learning on arts-based platforms.

It's a blast.
It's free.
And it gives the brain the
exact neurochemicals it
needs to learns best.

Did I mention
it's free?

II.
Patterns, Firings & Wirings

"Your brain craves patterns and searches for them endlessly. In the absence of adequate sensory input, it will even make its own."[5]

Thomas B. Czerner, MD

We begin with a most important insight into the learning brain: The brain likes patterns.

There.

How's that for revolutionary? Now you don't have to read the rest of this book. You've got it. Put it down and walk away.

Okay. Maybe not.

If you have ever seen a person doodling patterns and shapes on a notebook during a lecture, you know the Czerner quote (left) is true. If students aren't recognizing any relevance in what the teacher is presenting – if they see no patterns or connections to their own lives – their brains will subconsciously create their own patterns for them. Literally.

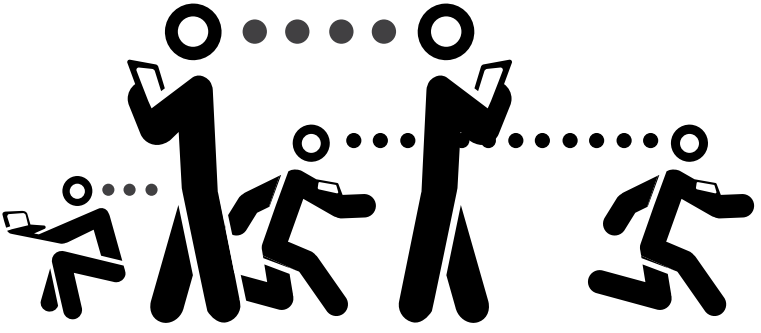
The brain loves patterns. It organizes itself around patterns. It is constantly searching for patterns to store, patterns to retrieve, and new patterns to connect with existing patterns in its memory array.

The brain hungers to make sense of the world. To do this, it needs to recognize patterns. Once the brain is efficient at recognizing a set of patterns, it begins to do amazing things.

Like...

II :

Read this if



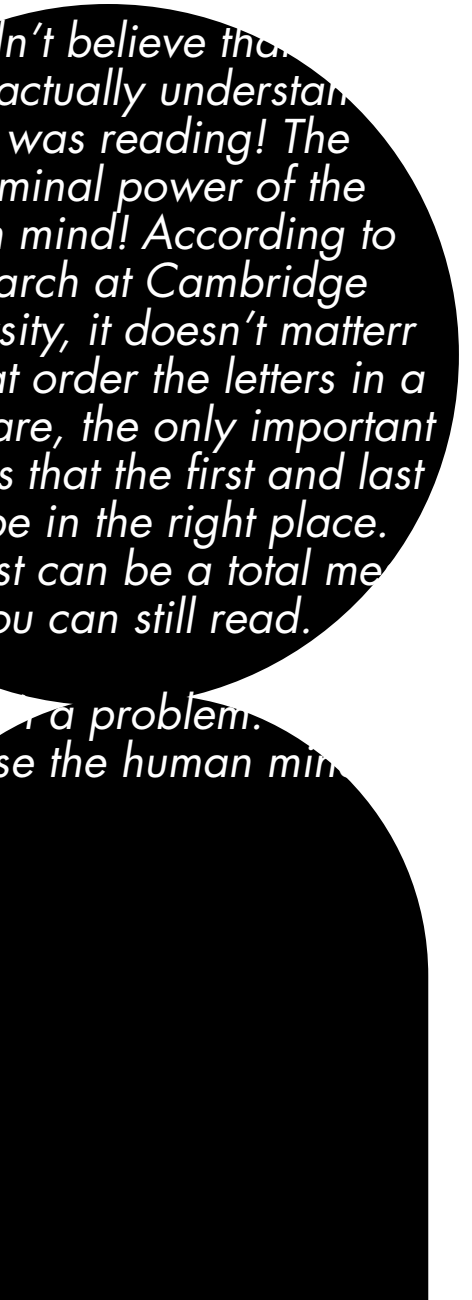
you can:

I cd'nuolt blveiee that I cluod aulaclty uesdnatnrd what I was rdanieg! The phaonmneal pweor of the hmuan mnid! Aoccdrnig to rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoatnt tihng is taht the frist and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed.

It wsan't a porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Amzanig huh? yaeh and I awlyas thought slpeling was ipmorantt![6]

II :


I cdnuolt blveiee that I cluod aulaclty uesdnatnrd what I was rdanieg! The phaonmneal pweor of the hmuan mind! Aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it deosn't mttaer inwaht oredr the ltteers in a word are, the olny iprmoatnt tihng is taht the frist and lsat ltteer be in the rghit pclae. The rset can be a taotl mses and you can sitll raed.
It wsan't a porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe. Amzanig huh? yaeh and I awlyas thought slpeling was ipmorantt!



Because you were already familiar with the patterns of the letters in the words, you didn't even need to see the letters in the right order for your brain to take over and unscramble the words. Your brain did the work for you, all because of the re+cognition, identification, comprehension and harnessing of formerly embedded patterns.

- **R**ecognize
- **I**dentify
- **C**omprehend
- **H**arness

That is how the brain learns. That is the foundation of RICH Learning. It's a no-brainer because it's a whole brainer. And it's no work at all once you saturate your brain with and embed the proper patterns. Let's apply this to reaching and teaching minds and hearts in the post-television world.

II :

How to Get RICH in Four Steps:

R*ecognize*
I*dentify*
C*omprehend*
H*arness*

*R*ich

The "R" in RICH Learning stands for recognize. How can the brain re+cognize anything if it hasn't first cognized it? In order to cognize anything new, you must first encounter it in a way that connects the "new" with something you already knew – an existing pattern embedded in the brain. Make this connection to an existing pattern and your brain automatically pays attention. (Note the words "pay attention.") If a new bit of information, stimulus, or experience is cognized in a way that connects it to existing relevant patterns, the new information is tagged as relevant enough for storage and future retrieval rather than removal. If tagged for retrieval, it becomes even more easily and efficiently re+cognized every time it is retrieved. Teaching the way the brain learns starts with cognizing the "new" and connecting it to an existing pattern in a way that is worthy of attention first, and then re+cognition.

r*I*ch

The "I" in RICH Learning stands for identify. Once you re+cognize a footprint in the snow, a scratched letter on a page, a fleeting smile on the face of a friend, or the sound of wind rustling in the trees, you must next identify what those sensory inputs mean. That footprint in the snow? Is it a deer or a panther? That scratch on the page? Is it a letter? A symbol? A word? That fleeting smile? Was it really a smile or a smirk? The wind in the trees? Was it merely a breeze or

something more sinister? Identifying the footprint in the snow, the scratchings on a page, the look in a friend's eye, the wind in the trees – this is the second essential step in learning anything new. But recognizing and identifying aren't the same as learning. Long-term learning takes two more steps.

*ri***C***h*

The "C" in RICH Learning stands for comprehend. In a 100-yard-a-second flash across the neural network, the brain begins to make sense and meaning of that footprint in the snow, that scratch on the page, that smile, that rustling wind. The more areas of the brain (and body) that connect to the new information being presented or re+presented, the faster, more reliable, and more long-lasting the comprehension will be.

Hold that thought. It will come in handy when we begin connecting the eyes to the ears to the muscles to the emotions using song, dance, art and theater as primary teaching tools.

That footprint in the snow. What does it mean? This is an important question.

If it is the footprint of a deer, it might mean "food!" If it is the footprint of a panther, it might mean "I'm food!"

I'd better comprehend this! Recognizing, identifying and comprehending properly are important skills to learn. They could have life or death consequences.

What is a footprint in the snow? It is a symbol, a sign, a representation

of something else. What is a letter on a page? It is a symbol, a sign, a representation of something else. The brain is brilliant at re+cognizing embedded symbols and translating them to meaning. It actually loves to do so. The very first "reading" we did as human beings was not the reading of words. Long before the Sumerians scratched symbols in clay to represent the sale of barley bushels and beer, human beings were "reading" symbols. We were cognizing, then re+cognizing patterns, shapes and symbols, then identifying them and translating them to meaning. Panther or deer? Barley or beer? Today we also learn to "read" long before we learn to read. Two-year-olds can re+cognize the McDonalds sign and differentiate it from the Burger King sign. What are they doing? They are recognizing symbols and translating them to meaning. That's reading! That scratch on the page: Maybe it is the letter C. How might I comprehend what it means? If I have been taught English, I know it might represent a sound like "K" as in "Cat" or a "C" as in "Ice" or "Cinnamon." Which is it? The brain can't comprehend or determine any meaning until it takes the context of the content into account.

Outside of the context, the content is meaningless.

When it comes to reading, our eyes dart forward 14-16 letters and backwards in a series of instant jerks and freezes called saccades and fixations.

Desperate to find a pattern that will help us make

sense of the word and the world, the brain searches for clues to meaning in the context surrounding the new information. What are the other letters, words and hints around this letter? The content of the letter, the word, the sentence, means nothing without the context. That's the second most important insight into the learning brain: Stuff around you matters.

There.

How's that for revolutionary?

That fleeting smile: Yes, it was a genuine smile. Or was it? Maybe that person likes you. Or maybe they're pretending to like you. Hmmmm… What are they after? You have cognized and re+cognized their smile. You have identified it as a smile. But hmmmm.... how might you comprehend what it really means?

What are the other clues around the smile? Can you "read" the intent in that person's eyes? In their voice? In their body posture? What might you comprehend from the context?

The wind rustling in the trees: Sounds like the weather is changing. Maybe rain tonight! Look around the sound. What colors are in the clouds? How fast are they moving? What do you smell in the air? What do you feel on your skin? What else might you cognize, re+cognize and identify that will allow you to comprehend the meaning of the wind?

When it comes to attention, comprehension and long-term retention of any new information, that which surrounds the letter, the footprint, the symbol, the smile, the wind, makes all the difference in the world.

Without a recognizable, identifiable context, the content is obscure. Maybe even meaningless. Outside of the context of recognizable patterns, there is no meaningful content. This is true neurologically. It is true psychologically, sociologically, educationally and ontologically. (Google that word.) That which surrounds a word makes all the difference in its meaning. That which surrounds a child makes all of the difference in their world.

Before we can make any difference for the children around the world, we must first make a difference in the world around the children.

Your surroundings frame and shape your potential, identity, meaning and future. Everything from the art you hang on the walls to the music you play in the halls to the thoughts you place in a child's head before they drift off to sleep at night defines and refines or constricts and confines who they are and who they will become.

A rich child can become very poor if they experience mostly negative, cold, under-stimulating and impersonal surroundings. A poor child can become very rich if exposed to great warmth, great dreams, stimulating ideas, positive touch and genuine encouragement. Rich and poor are not so much a state of finances as they are a state of minds and "mines" and stimulation and surroundings.

Recognizing, identifying and comprehending

are the first three steps in RICH Learning. If connected to rich patterns, they will grab your attention, but until the final letter in RICH comes in to play, there will be neither long-term retention nor deep meaning in what you are trying to teach. Let us move on to the final step of learning where the true magic RICHness appears.

ric**H**

The "H" in RICH Learning stands for harness. Until you harness that new learning and do something with it, it really isn't yours. Once you apply the new to the "knew" and work it to your advantage, it begins to hardwire itself into your brain and now becomes part of your intellectual and emotional toolbox. What does it mean to harness new information? That footprint in the snow? You may have re+cognized and identified and comprehended it to be a deer track. So what? Maybe now you can follow up on it, harness the knowledge and eat well tonight.

When it comes to early reading, to harness means to take that new letter, put it together with other letters that surround it, turn it into a word and figure out how to use it.

That fleeting smile? Maybe you re+cognized and identified and comprehended it as genuine. Maybe that person really does like you and the two of you have a future. But unless and until you harness that knowledge and follow up on it, it does you no good. Maybe it's time to cook up some venison stew to take along as a gift?

That wind rustling in the trees? Better seek shelter. If it rains, your venison stew won't cook on the

fire and you will have no future with that new friend. Recognize. Identify. Comprehend. Harness. That is how a baby learns to see, hear, crawl, reach, walk, talk, and make sense of the world. That is also how they learn to manipulate their grandparents into buying them the sugar cereal in the grocery aisle when their parents aren't looking. That is how a child learns to turn squiggles and wiggles and circles and lines into sounds and words and sentences and texts and tweets and maybe even into 500-page novels about star-struck vampire lovers who will make them weep one day when they turn into hormonal teenagers.

Recognize. Identify. Comprehend. Harness. That is how a human learns to find food, hunt, eat, reproduce, and navigate through the jungle, the sophomore year, the subway system and the SATs.

Squiggles and wiggles and circles and lines
Make up the alphabet, sounds of all kinds
Put them together and you can spell words
You can make any word you've ever heard
You can use letters – they have sounds
Letters – they make words
Letters – they spell things like L-E-T-T-E-R-S
Letters

from the song "Letters" in the movie "Skool"

III :

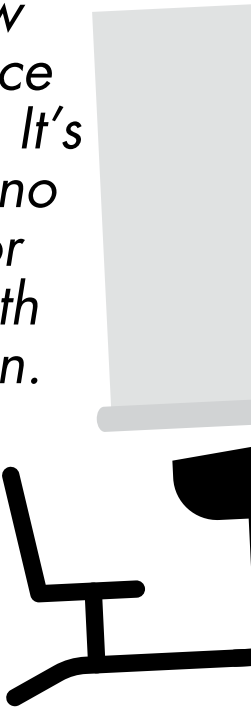
Attention, Retention, Tension, Detention

What's the biggest problem in schools today? One might argue we have an epidemic of attention problems. Recognize. Identify. Comprehend. Harness. All of these things help the brain pay attention.

RICH Learning is all about enriching the brain with experiences that help it recognize, identify, and comprehend new information, then taking that new information and colliding the "new" up against the "knew" to harness the attention, creativity, innovation, curiosity, and long-term retention power of the brain in a way that enriches your life. How do you set up the brain to "re+cognize" anything? How do you create complicated patterns that can fire and wire and be retrieved the moment you want or need them?

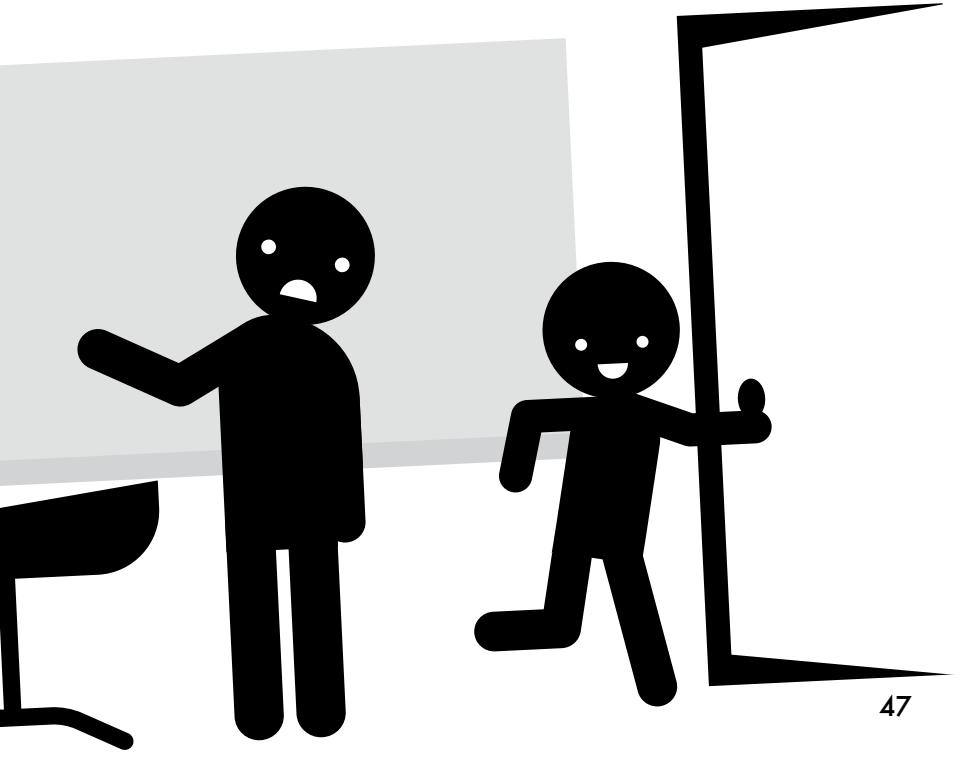
How do you teach something that will illicit both attention and retention? Something that will be meaningful today and be remembered the rest of your life? That's the trick. But it isn't really a trick at all.

You already know how to do it. You've known how to do it since childhood. It's actually a no - brainer for anyone with half a brain.

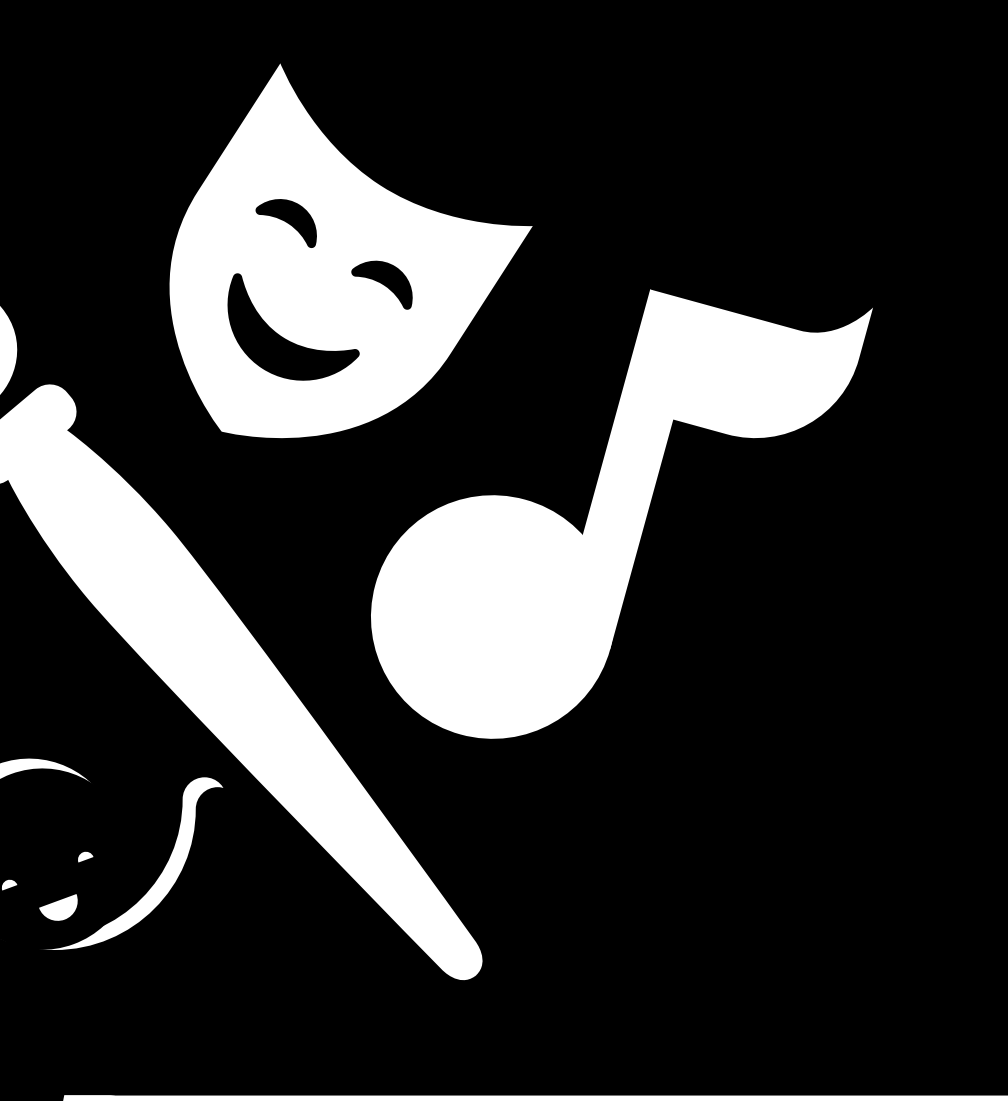


It has more to do with theater and less to do with lectures. It has more to do with singing and less to do with talking. It has more to do with movement and less to do with sitting in a desk. It has more to do with how you first learned to walk, talk, draw, wiggle, jiggle, giggle and play and less to do with school. (At least less to do with the current picture of what school is supposed to be.) It has more to do with the neurological reality of teaching the way the brain learns and less to do with classroom management. It has more to do with the arts and the hearts and less to do with class and sitting on your...

It is brain-based learning on arts-based platforms. And it's an absolute blast.



For a moment, let us exit the world of the classroom and enter the world of the Arts.



III.

RICH Learning and the Arts

"Art is the lie that makes us realize the truth."[7]

Pablo Picasso

Before we begin designing optimal, meaningful, neurologically sound, effective and memorable systems for new learning, it is important to understand what learning is not.

Contrary to popular belief, a new thought, fact, or memory is not a bit of information. It is not stored like you store words on a page, letters in a book or data on a hard drive. Perceptions, thoughts and meaningful memories are sets of electrochemical signals passing through the brain and body at 100 yards per second in a synchronized firing – a simultaneous array of electrical and chemical exchanges and waves. Like a movie coming over Netflix, a memory is a firing

and flashing of energy in integrated meaning-making patterns. What are the absolute best tools to instill and install these patterns for maximum attention and retention? What are the optimal techniques to both teach the concepts today and make them readily accessible years from now at the drop of a hat? What are the technologies available that spawn maximum creativity, innovation, team work and the skill knowledge workers will need to thrive in the world workforce of the 21st Century?

The Arts.

What? Why? Because the Arts engage significantly more sensory input devises in the learning process. Because the Arts connect significantly more areas of the brain, body and environment into the learning process. Because the Arts supply the brain with significantly more oxygen, glucose, endorphins and brain fertilizer for the learning process. Because the Arts enable and engage significantly more creativity, innovation, collaboration and team-working skills in the learning process. Oh yeah, and they're fun, too, so the learner has a significantly deeper interest in and commitment to the total learning process. And they might not even realize they are learning.

There. You have it. Now you don't have to read the rest of the book. Put it down and walk away.

Okay. Maybe not.

Let's look at four arts that don't cost a nickel but are worth a million bucks neurologically and educationally.

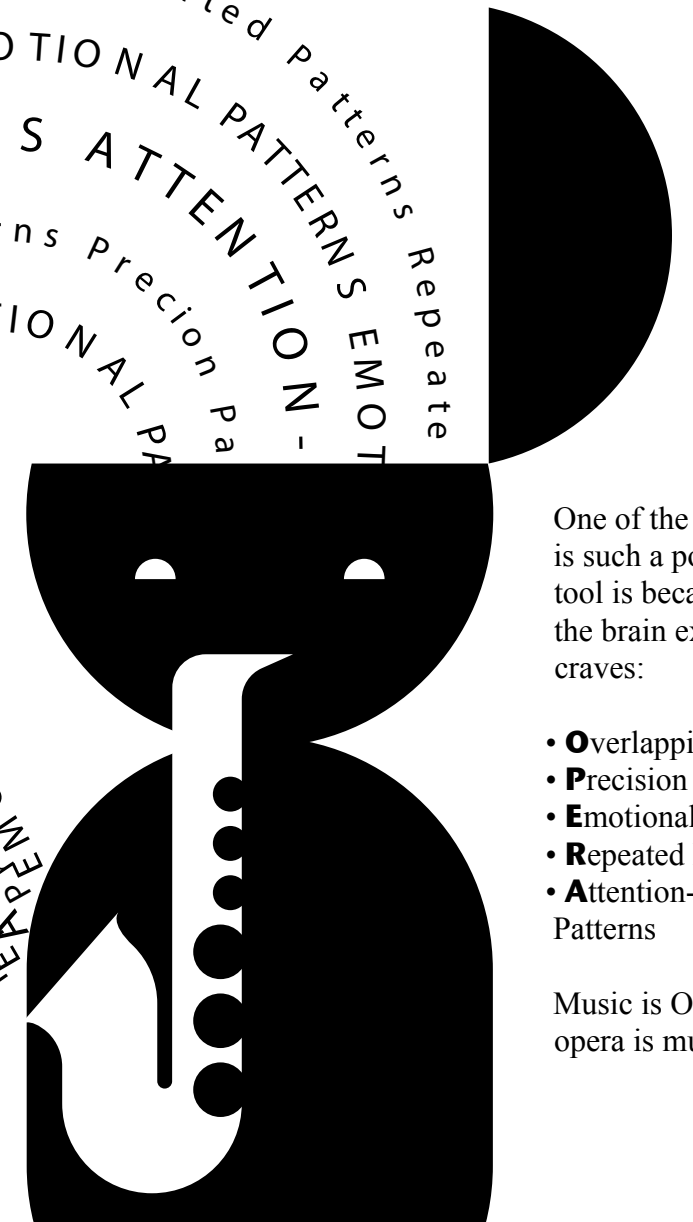
III :

A.

Why Teach with Music?

"Every kind of music is good, except the boring kind."[8]

Gioachino Rossini



One of the reasons music is such a powerful learning tool is because music feeds the brain exactly what it craves:

- **O**verlapping Patterns
- **P**recision Patterns
- **E**motional Patterns
- **R**epeated Patterns
- **A**ttention-grabbing Patterns

Music is OPERA, and opera is music.

III :

Patterns, Firings and Wirings

If you have ever caught yourself unconsciously tapping rhythms with a pencil on a desk or tapping your foot on the floor when you were nervous, anxious or bored, you know how a pattern-starved brain controls the body. Your brain was simply not receiving enough meaningful stimuli from the outside – enough relevant patterns – so it created its own. Did we mention the brain loves patterns?

Why is it you can remember a song from when you were five years old but you can't remember where you put your car keys five minutes ago? Part of the reason has to do with patterns. If you always set the car keys in the exact same spot you have no trouble at all remembering where they are. Why? Patterns.

Music is all about patterns. Chords are full of mathematical patterns. Rhyming words contain patterns. A melody is a complex pattern that activates the right hemisphere of the brain. Rhythm and harmony are patterns that activate the left hemisphere of the brain. The beat of the music travels deep into the sub-brain and actually starts to synchronize your heartbeat and breathing into a pattern.

Whenever I speak to a crowd with one or more guests over 70, I ask them to finish this line as I sing: "Winston tastes good like a (click click)…" The elders invariably respond, "Cigarette should!" That jingle was popular in the 50s. It went off the air in the days of black and white television.

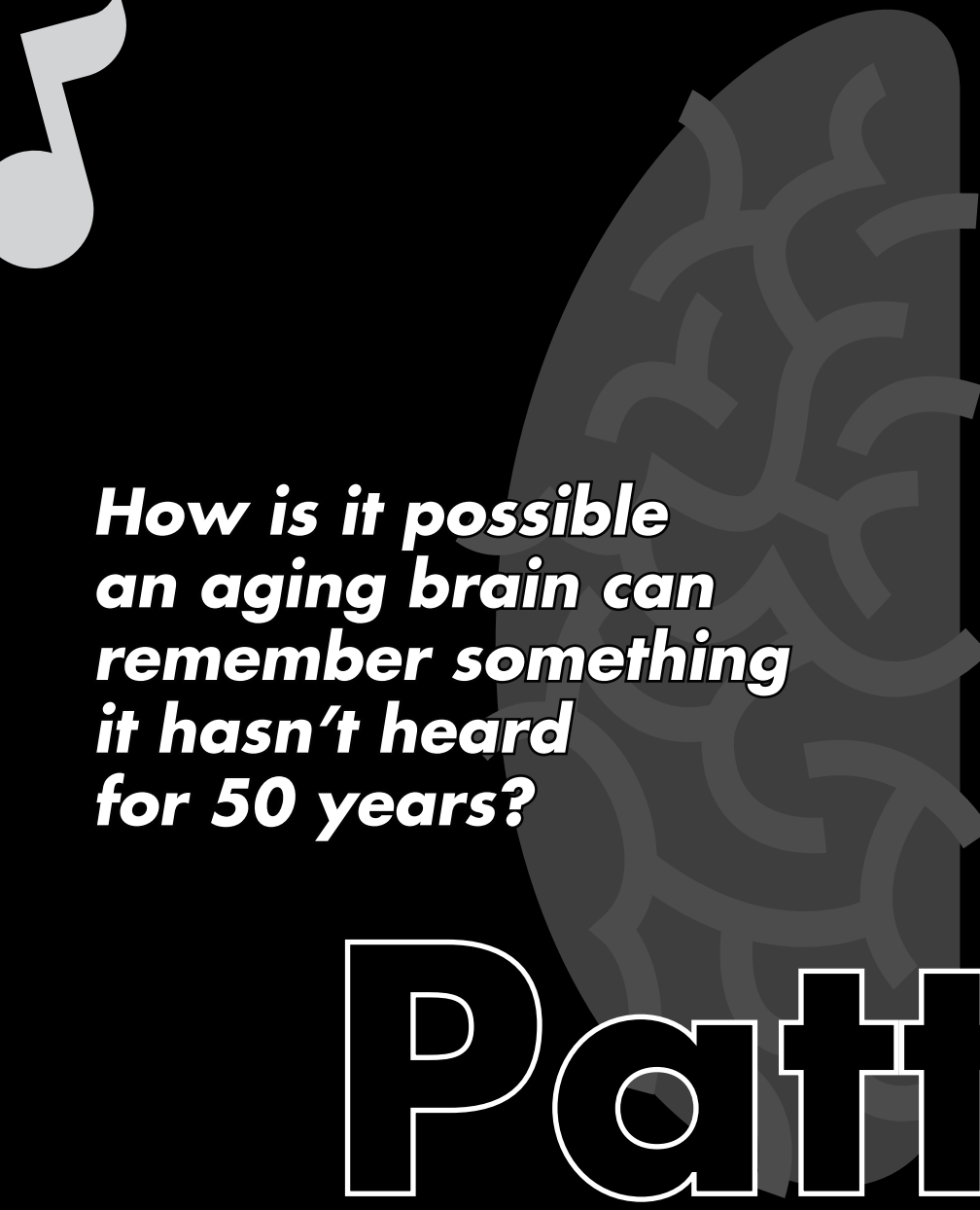
Let's try these on you...

Finish These Jingles:

1:
"Flintstones. Meet the Flintstones. They're a..."

2:
"Come and listen to a story 'bout a man named..."

3:
"One, two, three o'clock, four o'clock..."



How is it possible an aging brain can remember something it hasn't heard for 50 years?

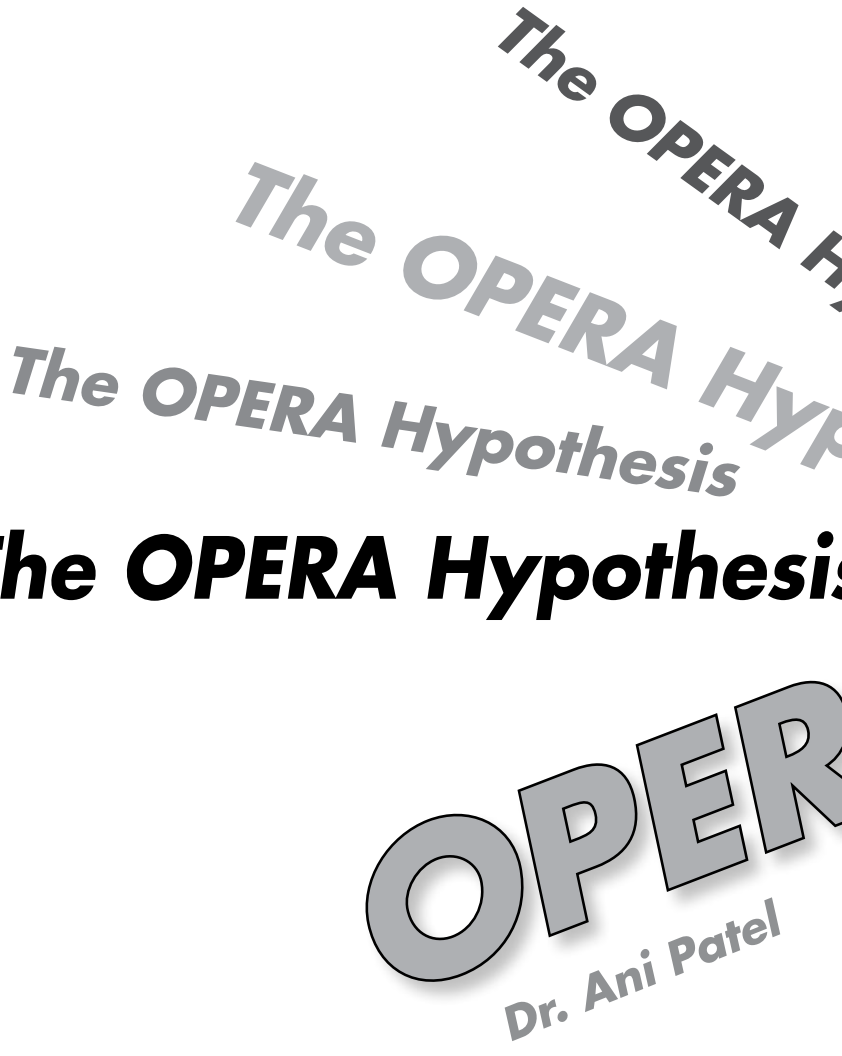
Patt

If you are an American over 50, you were most likely able to fill in the blanks with “modern Stone Age family” and “Jed” and “Rock” without any trouble at all. How was that possible when you may not have given the slightest thought to the “Flintstones” or “Beverly Hillbillies” or “Happy Days” in decades but you still know the lyrics instantly?

What business did music do in your brain in order to stick those jingles into your mental “not-so-hard drive” in a way that made them so easily retrievable years later? And what can you do as a teacher today that will help your kids remember today’s lesson tomorrow? Next week? Next year?

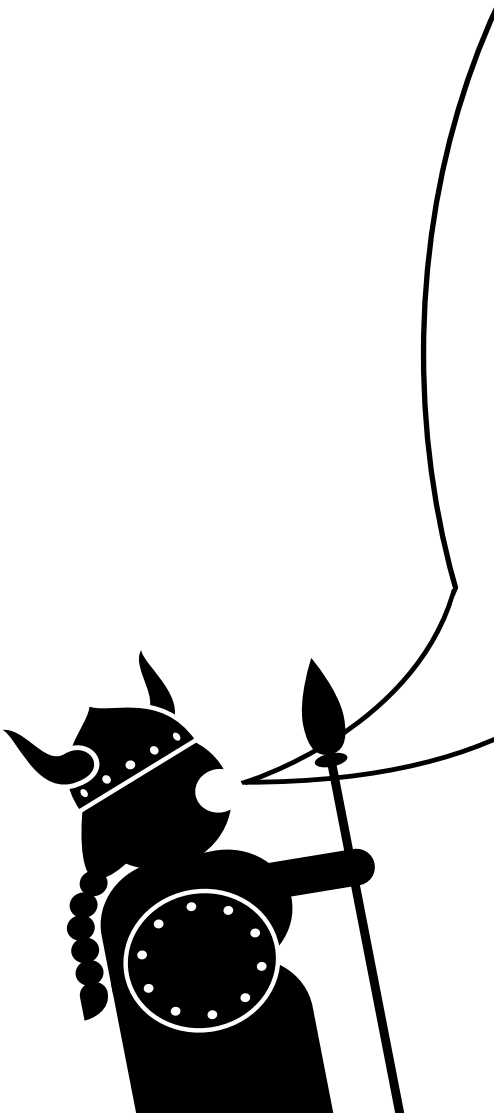
To answer this, let’s first borrow the brains of my favorite music neurologist, Dr. Ani Patel, and dissect his hypothesis of music’s effectiveness using his word OPERA as our memory device.

III :


The OPERA Hypothesis
The OPERA Hypothesis
The OPERA Hypothesis
The OPERA Hypothesis
OPER
Dr. Ani Patel

In a recent paper published in Frontiers in Psychology, Dr. Aniruddh D. Patel of Tufts University explained the power of music neurologically by proposing what he calls his "OPERA Hypothesis."[9] According to Dr. Patel, mounting evidence suggests that music works so well as an attention and retention tool because it engages at least five different overlapping systems in the brain.

Music engages the brain with:



O*verlap*

P*recision*

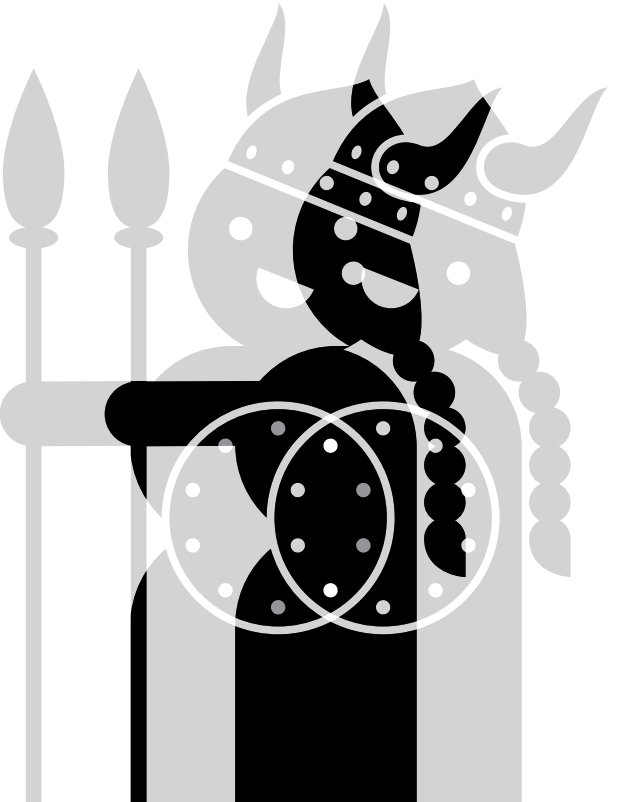
E*motion*

R*epetition*

A*ttention*

III :

Music engages overlapping parts of the brain.



Overlap

P

E

R

A

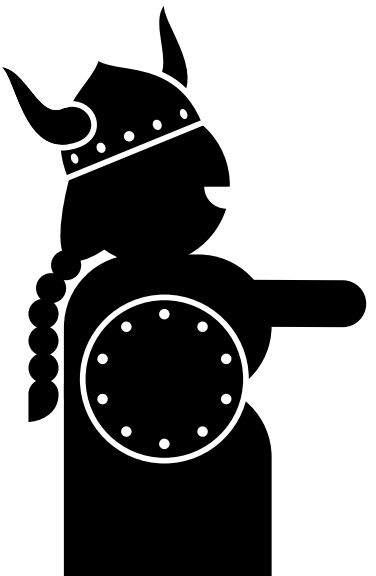
According to Dr. Patel: "There is anatomical overlap in the brain networks that processes an acoustic feature used in both music and speech (e.g., waveform periodicity, amplitude envelope) with focused attention."[10A]

Okay. What?

Let's just say music does lots of business in lots of parts of the brain and that overlapping firing and wiring helps the brain to focus.

III :

Music places
significantly higher
demands on multiple
shared networks
than does speech.



O

Listening to someone talk involves both precision and concentration. Listening to someone sing involves even more. Singing a lesson yourself – now that engages significantly more precision processing powers in the brain.

Precision

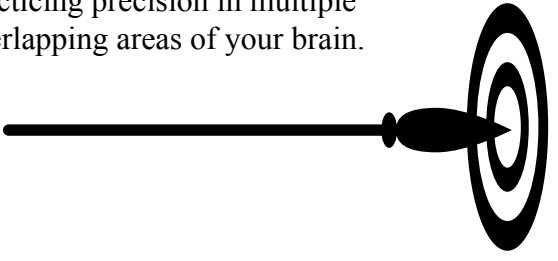
E

With music, your brain is measuring pitch, beat, timber, volume. When it comes to maximal engagement of the processing powers of the brain, if you have a choice between listening to a lesson taught with spoken words, listening to a lesson taught with music, or singing the lesson yourself, it's a no-brainer.

R

Sing it yourself. You will be practicing precision in multiple overlapping areas of your brain.

A



III :

Musical activities that engage this network elicit strong positive emotion.

O

P

What magical powers does music possess that can't be accessed or equaled by the spoken word alone?

Emotion

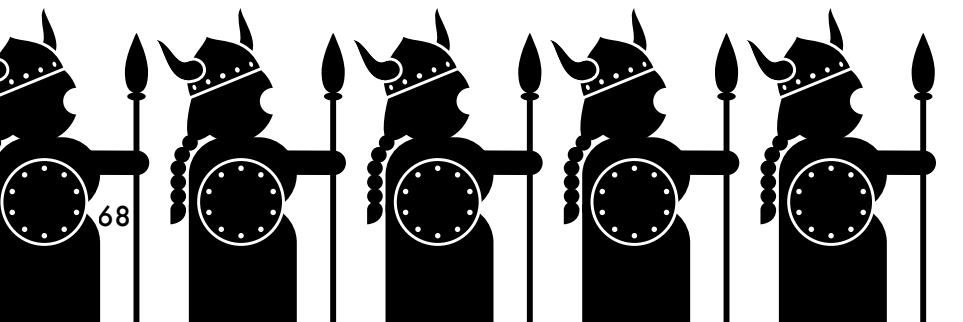
R

A

The brain is filled with gatekeepers designed to keep information out. You must go to and through these gatekeepers in order to access most of the brain. Music possesses a power to bypass the gatekeepers and "open the kid before you open the book" by engaging the emotional centers of the brain. Get to the emotional centers and the gates to the intellect fly open wide. Musical activities that engage emotional networks also elicit strong positive feelings and make the learning experience both more attentive and more retentive. [10B]

III :

Repetition causes
nerve cells to fire
more efficiently.



O

P

E

Neurons are like tiny wires. When you repeat a song, a chorus, a phrase, a jingle, the body secretes a dose of fatty tissue called myelin that insulates the wires. Electricians know if a wire is insulated better it will fire more efficiently. The repetition in music helps the brain do just that.

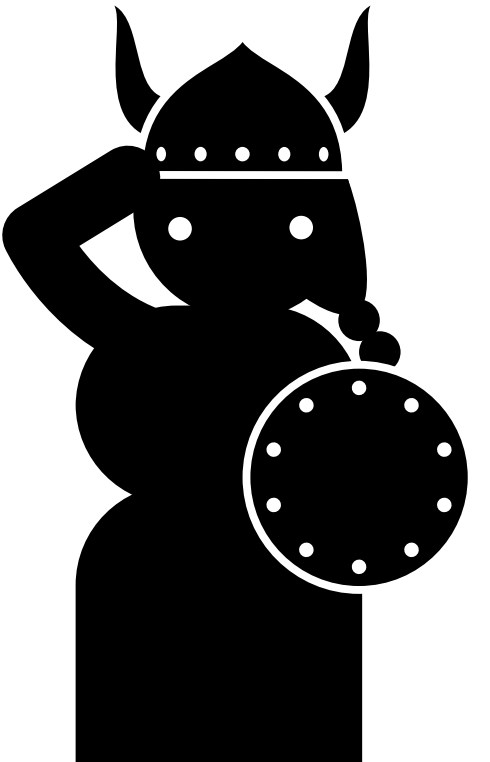
Repetition

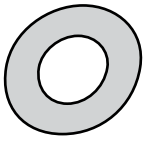
A

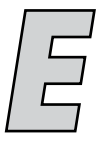
Repetition causes nerve cells to fire more efficiently. Repetition causes nerve cells to fire more efficiently. Did we mention repetition causes nerve cells to fire more efficiently?

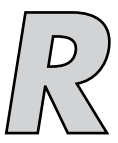
III :

Engage all of the above (Overlap, Precision, Emotion, Repetition) and the results are... focused attention and long-term retention.









Attention. Retention. You want it? With music you get it and much more. Dr. Patel writes: "According to the OPERA Hypothesis, when these conditions are met, neural plasticity drives the networks in question to function with higher precision than needed for ordinary speech benefits. The OPERA Hypothesis is used to account for the observed superior sub-cortical encoding of speech in musically trained individuals, and to suggest mechanisms by which musical training might improve linguistic reading abilities."[10C]

Okay. What?

Music helps speech. Music helps reading. And as you will see when we get further into practical applications of RICH Learning, music is going to help math, science, life skills and a dozen other topics as you enrich the learning experience for young and old alike.

Attention

III :

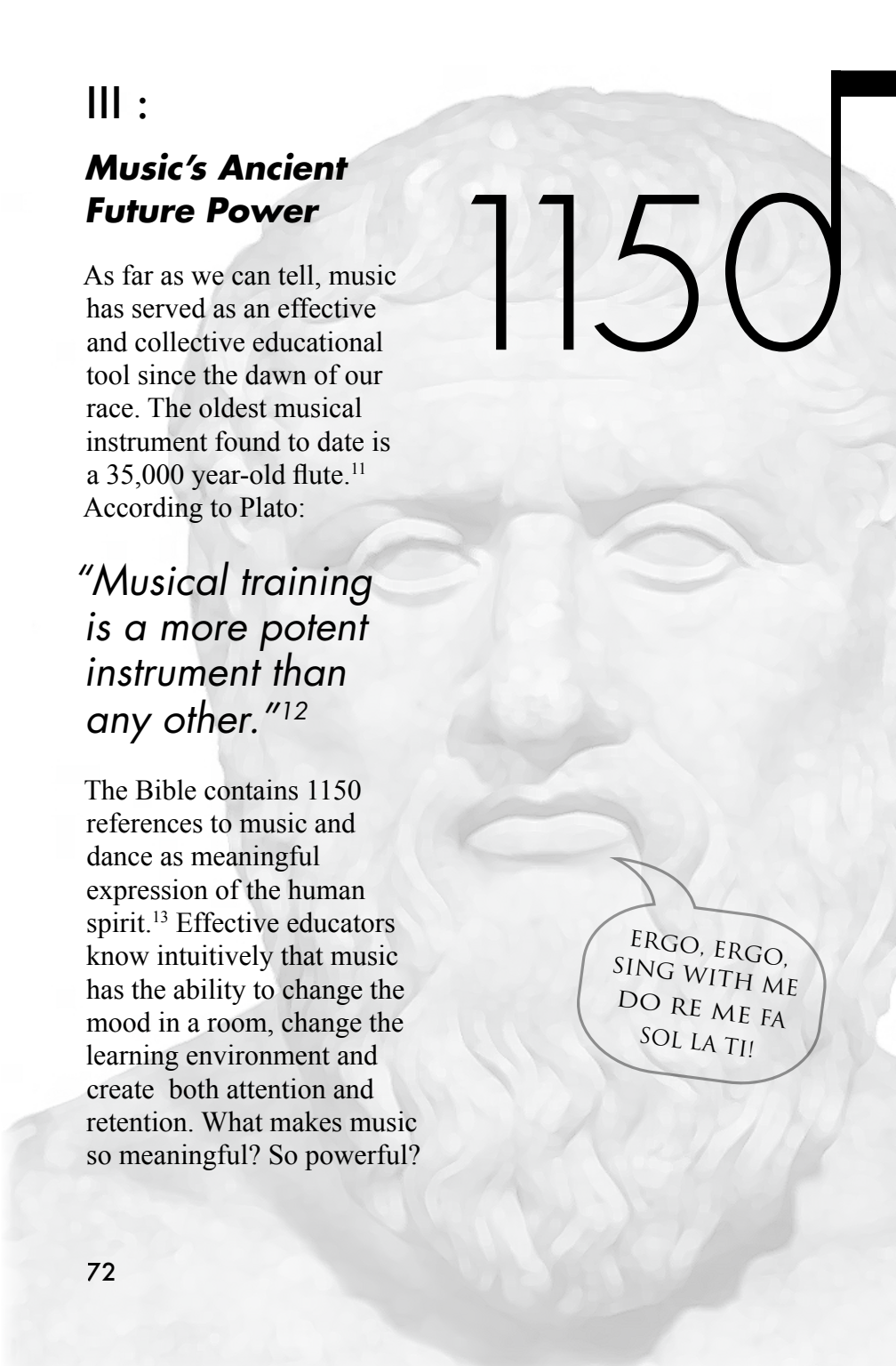
Music's Ancient Future Power

1150

As far as we can tell, music has served as an effective and collective educational tool since the dawn of our race. The oldest musical instrument found to date is a 35,000 year-old flute.[11] According to Plato:

"Musical training is a more potent instrument than any other."[12]

The Bible contains 1150 references to music and dance as meaningful expression of the human spirit.[13] Effective educators know intuitively that music has the ability to change the mood in a room, change the learning environment and create both attention and retention. What makes music so meaningful? So powerful?



Music Moves You

I did my doctorate in a branch of linguistic philosophy that studies communication, meaning and symbols and wonders "why anything means anything to anyone?" (The field is called semiotics.) Maybe because of my early reading disability, maybe because I had a mother who read to me every night, maybe because of my call and vocation, I've always been interested in words, communication and how one makes meaning in such a crazy-fast, over-scheduled, under-thought-out world. I began my dissertation thesis with the working title "The Meaning of Meaning in a Post-Gutenberg/Neo-Google World." (Yawn. Yeah. Okay. It sounded interesting to me.) For my research, I video taped interviews with 75 musicians, writers, dancers, philosophers, sociologists, movie producers, mothers dying of cancer, neurologists, parents, youth workers and people in the PR, branding and business communication fields. I asked them first to tell me what was meaningful in their lives. Then I asked them to help me understand the meaning of meaning to young people today. What did I find out? The book isn't out yet (see page 220) but I'll give you a hint.

The first person interviewed was Hunt Lowry* at Warner Brothers Pictures. Hunt has produced 30+ feature films, including the Oscar-Winning "Last of the Mohicans" with Michael Mann and Daniel Day Lewis. To this day it remains my favorite movie. I asked Hunt, "What makes a movie meaningful?" Hunt's answer: "It has to move you." Anything that moves you has both meaning and power.

**Watch Hunt's interview on "The Meaning of Meaning in Film" at www.youtube.com/watch?v=6ej5_hAOaTA*

This begs the questions: "Why does anything move you? How does it move you? Where does it move you? To what does it move you?" Following my 75th dissertation interview, I came to the conclusion that for anything to "move you" it must first get inside you and connect with something that is already meaningful to you. It must connect with deeply ingrained and hardwired preexisting patterns of meaning. Some of those patterns exist as conscious memories. Most reside in the deep, dark, murky connections of your subconscious. What makes music so meaningful, memorable and powerful? The first reason is it moves you. When you say something "strikes a chord" or "resonates" (literally re+sounds) you are really saying it connects with meaning already embedded deep inside you; meaning of which you might not even be aware. Music holds its power in a way that can hold you, then move you to a place you've been. And sometimes to a place you've never been before.

Music Points Beyond Itself

A second aspect of music's meaningful and magical essence is that, like a symbol or letter or sign, it possesses the power to point to something other than itself. During my semiotic research I came across a thinker named Jean-Jacques Nattiez who focused on meaning and music. He suggested:

"Meaning exists when perception of an object/event brings something to mind other than the object/event itself."[14]

Music does this all the time, sometimes without words. There are songs that can make you laugh, smile, yearn. A single strand of a sad sonnet can make you sob.

How is it possible music conveys meaning with such power beyond words? How does it sneak its way past your rational gatekeepers and do business deep down in your emotional brain?

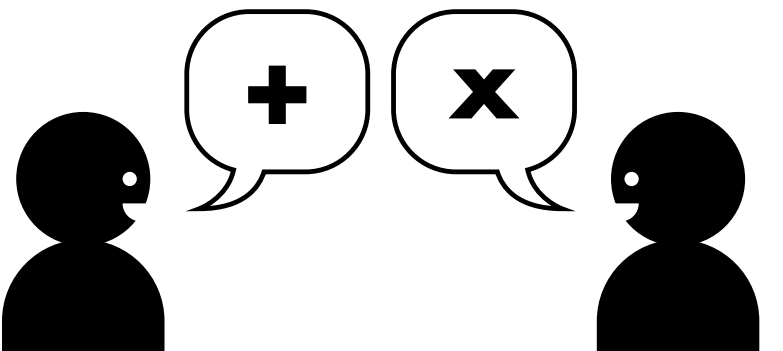
How can a simple tune bring a grin to your chin or a tear to the eye? And how might you harness this deep inner power for the benefit of attention and retention in this crazy-paced world?

Context Matters

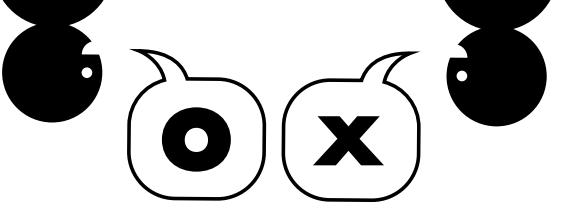
The third thing I learned from my 75 interviews was this: When it comes to meaning, context matters. (Sound familiar?) Context is not one aspect of meaning. It is the **main** aspect. Without a context for the content, nothing means anything. Nothing makes sense.

Music creates multiple, rich contexts of patterns for the content you are trying to teach. Let me show you why this is so important. Here's a brief crash course in semiotics to inform our exploration of the meaning of music.

Glance at the two symbols in the bubbles. What are these people saying? What do they mean?



III :



Now glance at the two bubbles above. What are they saying? If you are an English speaker with at least a grade school education, you probably identified the symbols on the previous page as "plus" and "times." You might have identified the symbols in the bubbles above as the English letters "o" and "x" or "hugs" and "kisses." How can the same two slanted scratches of an "x" mean "times" on one page and something altogether different on the next? Context.

On the previous page, the first symbol set a context, and your brain automatically read both symbols based on that information. What if I ask you to identify + as a religious symbol? Instead of a "plus" you now call it a cross. What if I ask you to identify + as a Mandarin number? If you know Mandarin, you say it is the number "ten" . Both the "x" and the "+" are just two intersecting scratches. Yet, they can mean many, many different things based merely on their context. The content needs a context – a meaningful preexisting pattern. Outside of a meaningful, re+cognizable mental pattern set around them, the scratches are meaningless. Once a context is offered, the connection to a pre-existing content pattern is established and these two scratches suddenly mean something real.

Back to music as a learning tool. Again, to re+cognize anything, you must first "cognize" it. And the cognizing happens best when it is embedded inside, around or near a meaningful, memorable, moving context or pattern.

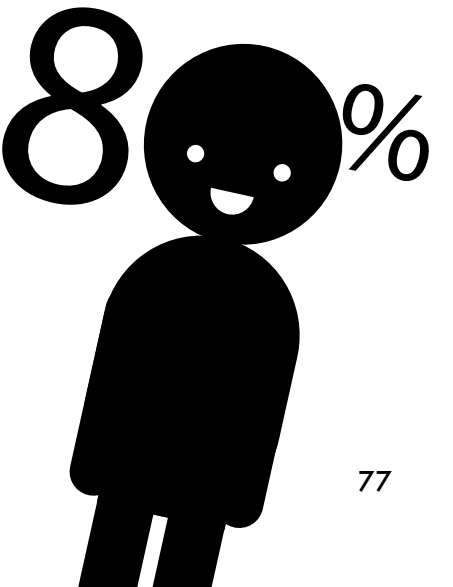
Music may be the most potent pattern-producing tool you have in your arsenal as a teacher. Music creates a vast array of complex, meaningful patterns on multiple levels in the brain. These patterns can be used to make the embedding, triggering and retrieval of new information significantly more effective and efficient than the spoken word.

Music is Math

Two decades ago the University of California, Irvine, conducted a study on the effects of music on small children. One group of 3-year-olds was engaged in piano lessons and singing daily. The other was not.

Music is math and math is music.

After eight months, the musical preschoolers scored 80% higher in puzzle skills than the non-musicians.[15] 80%! Researchers discovered that music trains the brain for higher forms of thinking. Music builds upon and strengthens the same neural circuitry that is used in math skills. It expands the potential for understanding spacial intelligence, precision, measuring – and nearly everything else – by building a multi-layered neural super highway for the processing of information.



III :

The No-Brainer Whole-Brain Music Train

Music is a no-brainer educational tool precisely because it is a whole-brainer. Adding music to the **core** of all learning – not merely as one subject among many – is one of four foundations of RICH Learning. Because of its unparalleled power, we have chosen the music engine to pull all other learning along in our RICH Learning educational philosophy.

Music Mechanics

Allow me to get technical with the neurology of music for a moment. First, picture a train engine pulling a long line of cars.

The engine is music.


Music

III :

According to Daniel J. Levitin in This Is Your Brain On Music:

"The moment a melody begins, the Auditory Cortex (analyzing sounds, perceptions, tones) hooks up to the Motor Cortex (movement, foot tapping, dancing), which hooks up to the Sensory Cortex (tactile feedback), which hooks up to the Prefrontal Cortex (creation of expectations, violation and satisfaction of expectations), which hooks up to the Cerebellum (movement, emotional reactions), which hooks up to the Visual Cortex (reading music, watching performers or people around you), which

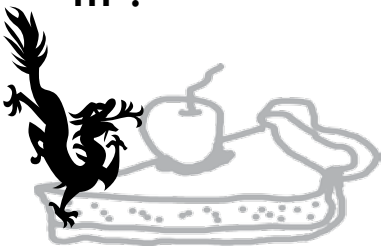
hooks up to the Corpus Callosum (connecting left and right hemispheres), which hooks up to the Hippocampus (creating memory for music, experience and musical contexts), which hooks up to the Nucleus Accumbens and Amygdala (emotional reaction to the music)."[16]

All of these areas of the brain fire, chatter, wire and link up with one another while the music plays, increasing nerve connections between multiple parts of the brain and body while codifying them into retrievable memory patterns. And the results? An entire brain lit up, hooked up, and delivering short-term attention and long-term retention.

What's the biggest challenge in education today? Some would say it is attention problems. Attention isn't just a commodity, it's a currency. Our brains don't want to "pay attention" unless we think we are going to make good returns on our investment. With music lighting up all these areas of the brain, we can't help but "pay attention." And guess what? We love it. Why?

Cheesecake.

III :

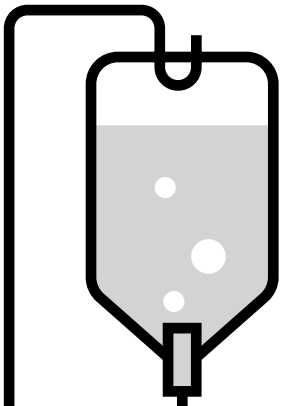


Auditory Cheesecake

"Music appears to be a pure pleasure technology, a cocktail of recreational drugs that we ingest through the ear to stimulate a mass of pleasure circuits at once. Music is auditory cheesecake, an exquisite confection crafted to tickle the sensitive spots of at least six of our mental faculties."[17]

Dr. Steven Pinker

Auditory



According to neurologist Dr. Steven Pinker, music's power doesn't just come from the delivering of patterns to the brain. It is not merely an OPERA of overlapping, precision, emotion, repetition and attentional connections that makes music so potent. Music is also a mixer of a magical elixir of memory enhancing drugs that wash the brain with pleasure chemicals. Dr. Pinker suggests that melodies are pleasing to the ear for the same reason symmetrical, regular, parallel, repetitive doodles are pleasing to the eye. They exaggerate the experiences of being in an

environment that contains strong, clear, analyzable signals from interesting, potent objects.[18] They exaggerate their own patterns while connecting to exaggerated existing patterns already embedded in the brain.

Neurons firing in synchrony with a sound wave find and release pleasure drugs in the brain and give you a feeling that your brain and body are part of – at one with – something outside the self. The feeling that you are part of a greater whole – of a choir, of a dance, of a tribe, of a movement – that feeling is a drug in and of itself. So yeah, add music at the core of your information acquisition, and you're injecting your students' brains with free drugs.

If the brain and body crave patterns to such an extent that they will create them when they are absent (doodling, foot tapping), if music is filled with patterns and its presence causes a flood of pleasure drugs throughout the brain and body, and if songs that have been buried for decades can come effortlessly to the surface at the mere mention of the lines that precede them, why wouldn't the educational systems architect build musical patterns into the very DNA of **every** curriculum, lesson and learning experience?

Music was the first technology to reach the pre-Gutenberg world. It may be the best technology to reach the post-Gutenberg, neo-Google world.

But wait,

there's more!

there's more!

there's more!

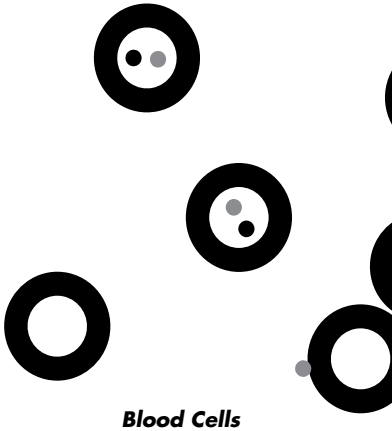
III :

B.

Why Teach with Movement and Motion?

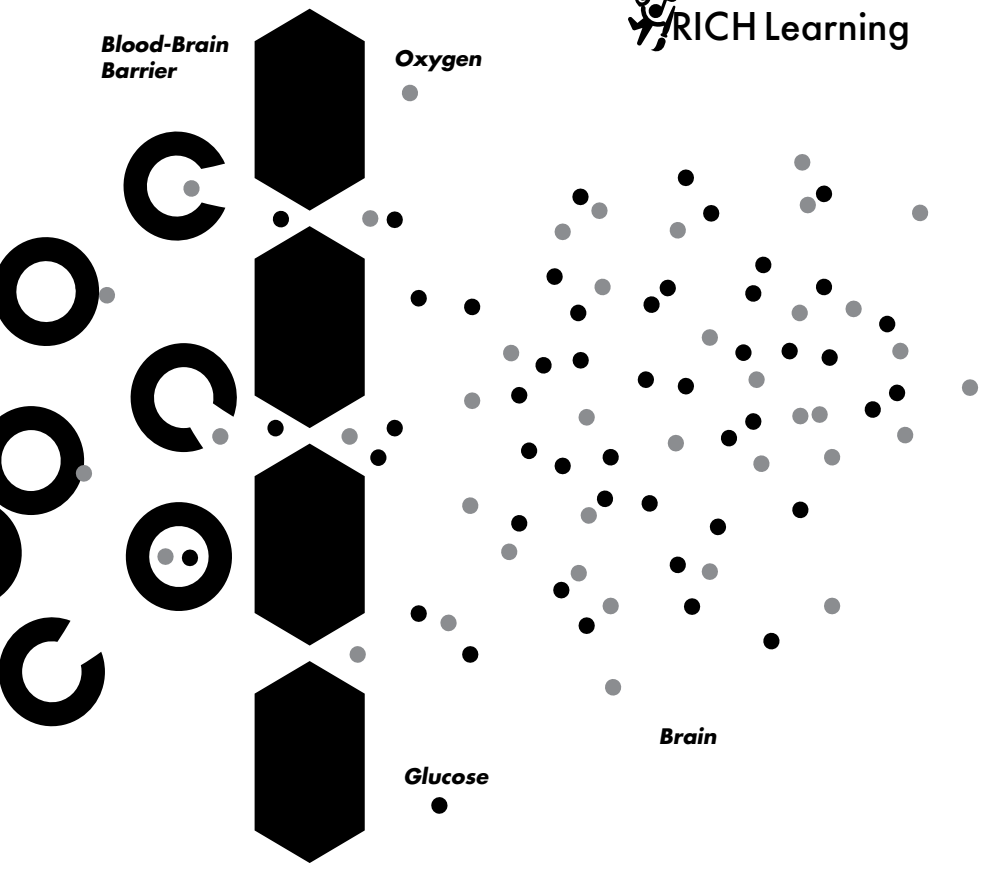
"As far as the brain is concerned, if we're not moving, there is no real need to learn anything."[19]

Dr. John J. Ratey

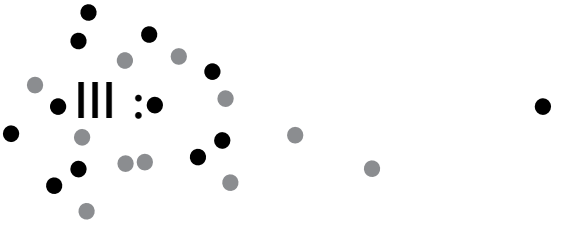


Blood Cells

There is a barrier between the blood and the brain. It's called the "blood-brain barrier." (Creative title, huh?) This protective wall is designed to keep big molecules like bacteria out of the brain. There are two natural molecules small enough to make it through the wall with no problem at all: oxygen and glucose. Moving your body while learning a lesson or language or while trying to solve a particularly difficult



math equation floods your brain with both oxygen and glucose. The higher the oxygen level, the more the brain can focus and stay alert. (Think "oxygen = attention.") The higher the glucose level, the more efficiently the cells of the brain can fire, wire, grow and connect. (Think "glucose = retention.") What happens to learning when you flood both oxygen and glucose into the brain through employing movement in your teaching environment? Attention and retention.



According to Dr. John Medina, molecular biologist from the University of Washington in his book Brain Rules, adding movement and motion to your learning environment provides the following benefits:

- *Exercise acts directly on the molecular machinery of the brain itself. It increases neuron creation, survival, and resistance to damage and stress.*
- *Exercise positively affects executive function, spatial tasks, reaction times and quantitative skills.*
- *Exercise increases oxygen flow to the brain, which reduces brain-bound free radicals. (Deadly!)*
- *One of the most interesting findings of the past few decades is that an increase in oxygen is always accompanied by an uptick in mental sharpness.*[20]

Think O^2 and Glue. Attention and retention. Who wouldn't want that in a classroom? But wait, there's more.

Best Darn Nerve Fertilizer (BDNF)

According to one of the nation's leading experts on ADD and ADHD, Harvard Medical School's Dr. John Ratey in his book Spark: The Revolutionary Science of Exercise and the Brain, exercise sparks the master molecule of the learning process: BDNF (Google Brain-Derived Neurotrophic Factor). [21] I call it "Best Darn Nerve Fertilizer" when I teach the masses.

BDNF is a protein that both builds and maintains circuitry by fertilizing nerve cells and fortifying the area of the brain that turns baby stem cells into new nerve cells – the hippocampus.[22]

Dr. Ratey shows how BDNF gives brain cells and synapses the tools they need to:

- *Take in new information*
- *Process new information*
- *Associate new information*
- *Remember new information, and*
- *Put the new information into context with existing information*[23]

BDNF

III :

Movement and Learning

One of the most prominent features of exercise and its release of BDNF is an improvement in the rate of learning. You want to get children paying attention, learning faster and remembering longer? It's actually quite simple and it doesn't cost a cent. Exercise supercharges mental circuits, beats stress, lifts mood, boosts memory and enhances both attention and long-term retention. According to Dr. Ratey, exercise improves learning on at least four levels: [24]

1. Optimizes mindset to improve alertness, attention and motivation;

2. Prepares and encourages nerve cells to bind to one another (the cellular basis for logging in and encoding new information);

3. Spurs development of new nerve cells from stem cells in the hippocampus, and;

4. Improves cognitive flexibility – the ability to brainstorm creative thoughts.

III :

Two More Mighty Memory Molecules

Along with pumping oxygen, glucose, and BDNF across the brain and body, exercise sparks the production of two additional key neurotransmitters:
1. Norepinephrine (attention, perception, motivation, arousal), and **2. Dopamine** (reward, attention, movement, calming).
Norepinephrine opens blood vessels so even more oxygen flows to the brain. Dopamine is a pleasure drug that tells the brain, "I want more of this!" Hmmm. Students with more attention who crave more of the learning process. What teacher in her or his right mind wouldn't want more of that? And guess what? It's easy to implement and it's all free.

Long-term Learning and Muscle Memory

What does all this have to do with learning? Let's consider the complex task of learning to ride a bicycle and apply it to education. You can learn to ride a bike at age 5, get off at 15, hop right back on at 75 and immediately ride again after a 60-year break. How is this possible?

First and foremost, you didn't sit in a chair and learn to ride a bike the way schools teach most every other subject. You didn't study a bicycle manual and take a written test. You got out on the road and learned the way the brain learns best – through action! What happened neurologically? Your entire body became a learning tool when you were riding

that bike. The hair-like ciliated epithelial cells in your inner ear connected to and coordinated balance with major and minor muscle groups in your torso, arms and legs. The depth perception neurons of your eyes connected to your ears and the emotional centers in your brain ("You can do it! Come to mama!") Overlapping precision circuits of muscles, senses, motions and emotions were flooded with oxygen, glucose, BDNF, dopamine and norepinephrine as you began to master the motion and balancing process of riding. Neurons throughout your brain and body fired, wired, patterned, then hard-wired the "skill memory" across a vast array of muscles, organs and bones. You didn't learn to ride with your brain only. You didn't learn to ride with your muscles only.

The brain met the body met the environment. There was overlap, precision, emotion, repetition and attention. (Dr. Patel's OPERA, anyone?) Without that orchestrated and synchronous wiring and firing of complex patterns, you would have never learned in a way that would be remembered 6 minutes later, let alone 60 years later. Motion collided with emotion and an endorphin rush when you finally took the training wheels off! You mastered this difficult and unnatural skill – a skill no one is born with – and you will remember it the rest of your life.

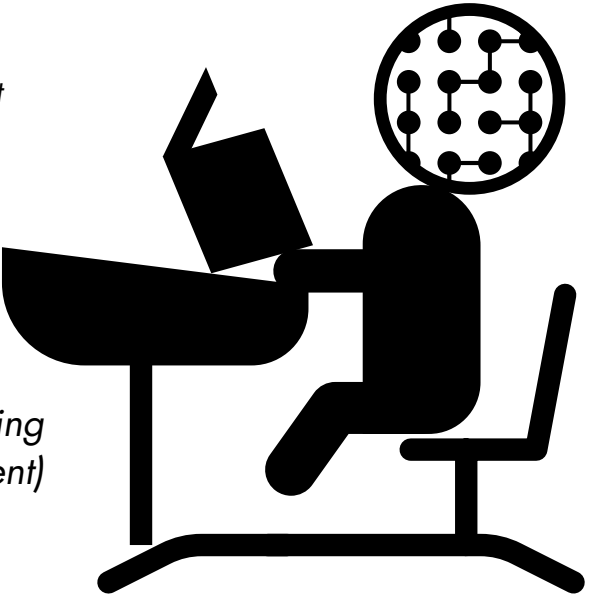
III :

"Everybody come on and sing and shout! We're gonna have fun and dance and move about! So get up off your seat! Come on move your feet, Just dance!"

from the song "Just Dance" in the movie "Skool" (listen at www.richlearning.com)

Muscle Skill Memory

Muscle skill memory is a powerful and enriching tool. It is among the most attentive and retentive assets you have in your teaching arsenal. It is among the most efficient and effective forms of learning you can enlist. It is among the most easily retrieved of all



Static Learning (Non-efficient)

long-term learning. With muscle skill memory, you learn new things quickly and master them over a shorter period of time. Like learning to walk (another complex whole-brain/body/environment skill), much of what you hardwire into your brain and body through muscle skill memory will be with you the rest of your life. Not only that, the best of science today suggests muscle skill memory has an **unlimited storage capability** in the brain. Washing the brain with O^2 (oxygen), Glue (glucose), BDNF and the other healthy chemicals while attempting to learn a complex new skill such as riding a bike, dancing, sign language, a skill sport (skiing, tennis, ping pong) or anything else for that matter, causes additional OPERA effects to kick in on behalf of learning. The Overlap, Precision, Emotion, Repetition and Attention of movement (yes, movement is OPERA) combined with all the healthy molecules and chemicals coursing through your brain and body causes the new learning to become both more attentive and more retentive – both more immediate and long lasting.

Active Learning (Efficient)

Yeah, we would want that, now wouldn't we?

III :

No-Brainer/

Whole-Brainer

One of the reasons attaching movement to learning works so well has to do with all of the connections movement fosters across the brain and body. The more connections and the more systems involved in the learning, the quicker and more long-lasting the learning becomes.

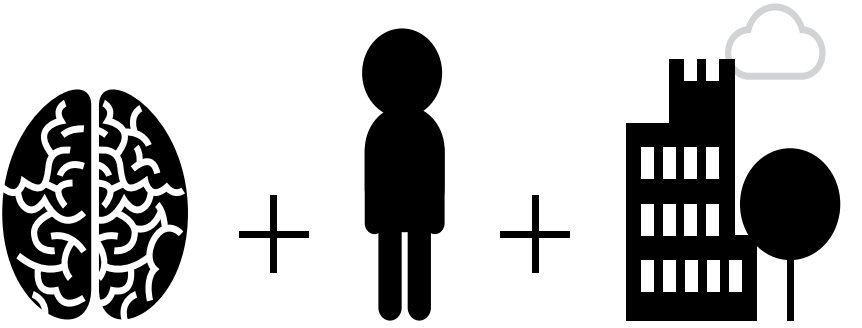
There is a huge difference between listening to a Mozart concerto versus performing it. By adding actions, dance, motion, skill and sign language to the core of a learning experience, the brain, body and environment all fire together and wire together in powerful meaning-making patterns. The brain, the body, the environment: reach these three spaces and you are reaching into the mind.

Mind =

Reaching and Teaching the Mind

I first met Dr. Ani Patel when he was a fellow at the Neuroscience Institute in San Diego, CA. I had traveled to meet the author of Music, Language and the Brain and to interview him for my doctoral work and book on The Meaning of Meaning in a Post-Gutenberg/Neo-Google World. (See page 220)
I had always known music and movement worked as memory enhancing tools. I just didn't know why.

Sitting beneath a string of Japanese lanterns under



a beautiful February evening sky with a decent California Malbec, the discussion turned philosophical. I asked Ani "What is the mind?" He answered without missing a beat: "It's the brain meets the body meets the environment."

The brain meets the body meets the environment. Add music to movement to meaning to memory to friends to fun to dance to theater to art, and you not only connect the whole learning process. You engage the whole mind. It suddenly occurred to me:

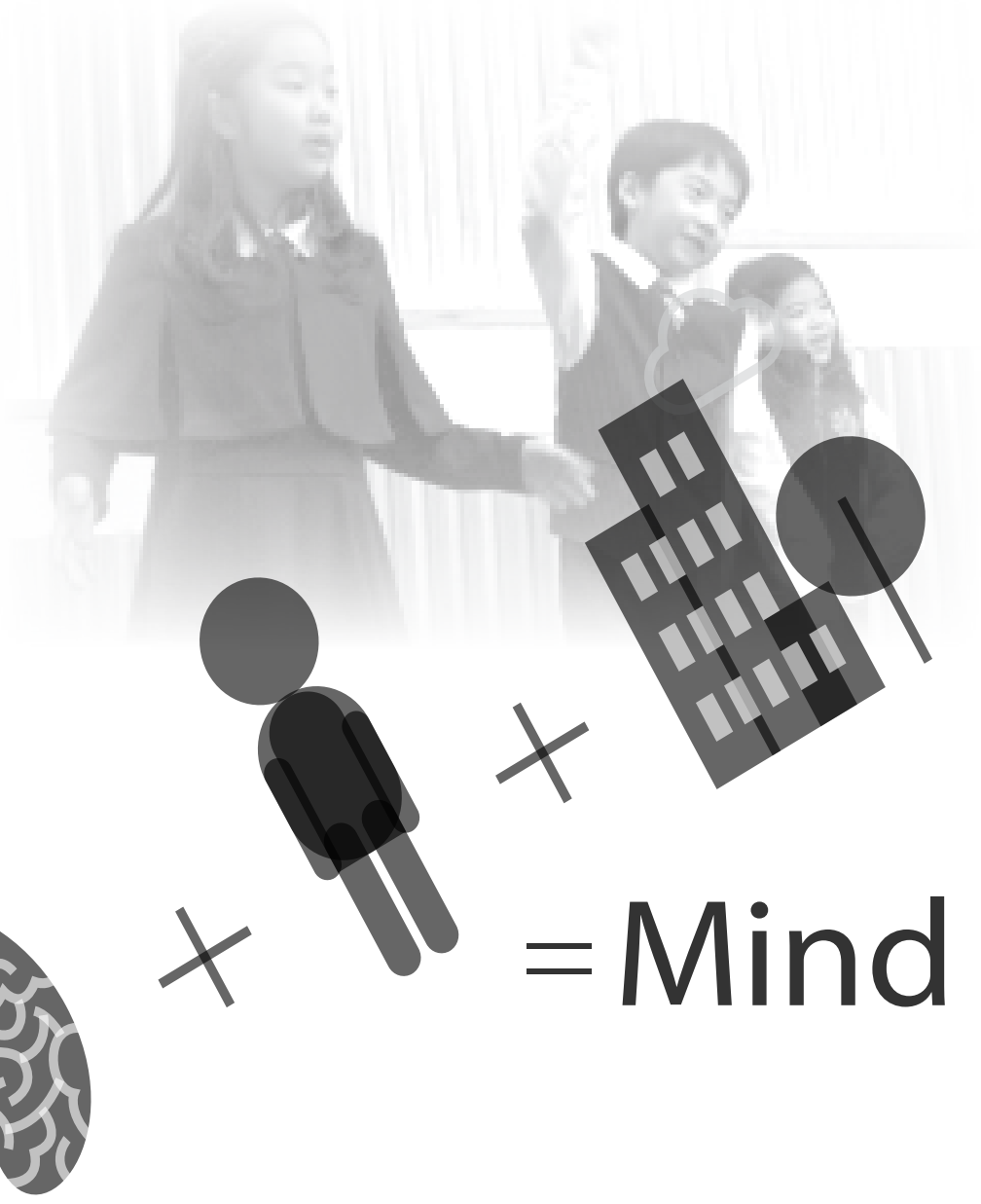
Leave the body and environment out of the learning experience and you are losing 2/3 of your mind before you even start.

Ponder this again. It is worth the price of the book.

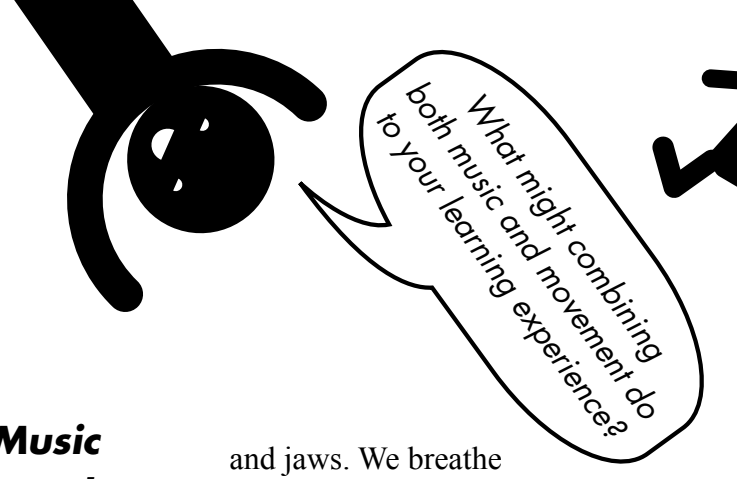
III :

Leave the body and environment out of the learning

experience and you are losing ***2/3 of your mind*** *before you*


=Mind

III :



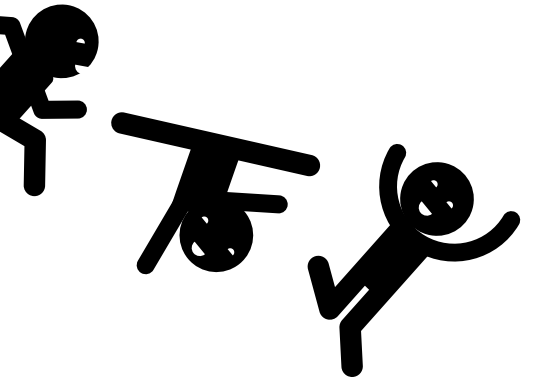
Adding Music to Movement

Before we enter into this exploration in the design and creation of optimal learning environments for the post-Gutenberg/ neo-Google mind, it is important to note one thing:

Music IS movement.

Music is movement. Music is movement. Did I mention music is movement?

When we sing, we move our diaphragms up and down. We move our heads and lips and vocal chords and jaws. We breathe harder, pump more O^2, Glue and BDNF into the brain while connecting a huge array of muscles together, stimulating the brain further. Music is movement, but when we combine music and intentional body movement like dancing to a rhythm and using our arms and legs to symbolically represent words as actions, a myriad of additional new connections (synapses) appears in the brain. Neurons throughout the body link with neurons in the brain making anything and everything we want to attach to the lesson significantly easier to learn. Whether it's memorizing simple things like spelling



and language or complex concepts like the elements in the periodic chart, embedding the learning in lyrics is brilliant neurology! It feeds the brain everything it needs to work its magic in its own marvelous, miraculous, mystical way. Add dance, motions, movement, sign language and maybe even some wiggling on the floor to the lyrics, and you pour kerosene on the neural memory fire by creating even more powerful cross-brain, cross-body, cross-environment OPERA effects. Embed what you want to teach in song and dance and sign, and every time the music and movement are connected and repeated, synapses across the entire learning platform get even more efficient at recognizing the array of sensory input. The song and movement together become a powerful complex pattern which the brain quickly learns, quickly registers and can easily recall, retrieve and relive.

Here's a strange truth: once the music and motion patterns are embedded in the brain and body, you can literally practice the song and dance by closing your eyes and not moving a muscle. The imprinting of music with motion is so potent that simply by visualizing a song and dance your brain will retrieve the patterns from its memory banks and allow you to reinforce them. The benefits of a silent rehearsal

are still valid and effective. You can practice free throws by visualizing free throws in your bed. You can practice a song about the times tables by thinking about it and not even opening your mouth. The same memory arrays fire, wire, strengthen and grow just by thinking about it. But add the actual skill memory, oxygen, glucose and BDNF you get from the sensory bombardment of music and movement and... well... you have created a crazy powerful attentive and retentive learning platform. And it doesn't cost a nickel.

Desks and Chairs

Here's a radical question: Do you need desks and chairs in a theater? Only for the spectators. To the serious neurologist...

Desks and chairs are your educational enemies. When it comes to learning, desks and chairs are completely anti-brain.

In our first series of tests of the RICH Learning methods, models and materials in Minnesota, there were desks and chairs in the classroom. In our second set of test with 50 children and a dozen teachers from all over India, we literally banned desks and chairs from the learning space and only used them outside for games like musical chairs.

The results?

See for yourself at www.richlearning.com.

III :

One red ant
One red ant
Marching up
my leg pant
One red ant
A-N-T, A-N-T
A-N-T spells
ant you see!

from the song "One Red Ant"
(listen at www.richlearning.com)

Sign Language and Small Muscle Movement

One more thing about muscle memory: large muscle groups aren't the only tools in your "muscle skill memory" learning arsenal. Consider harnessing the power of small muscle groups like hands and fingers to aid in your learning experience through using sign language.

For our first pilot project of RICH Learning in Minnesota, we decided to add American Sign Language (ASL) to the spelling of animals and foods, just to see what muscle memory might do to enhance attention and retention skills. I became a preschool teacher, singing and signing and jumping and laughing and wiggling on the floor with ten 3 and 4 year olds for

seven weeks. Aside from losing five pounds over that summer, the biggest surprise of all was how effective adding ASL was in the acquisition of spelling skills. It was almost a miracle how children learned to spell faster and remember the spelling longer with the simple addition of muscle skill memory to the equation. Motion is one thing. A good thing. But motion with meaning attached is magic!

In our second RICH Learning pilot project, I became a preschool teacher in Chennai, India, for seven weeks. We brought in teachers from 10 cities to take part in the experiment with us. Singing and signing and jumping and laughing and wiggling on the floor with fifty 3 and 4 year olds, I lost 18 pounds.
The big surprise again came at how easily children – most of whom had never spelled an English word in their lives – learned to spell Ant, Apple, Bee, Banana, Cat, Carrot, Dog, Date, Emu, Eggplant, Fox, Fig. We even threw big words like Adventurous, Brave, Confident, Devoted, Encouraging and Forgiving into the mix. Remember: these were preschoolers.

We videoed them on the first, third and final weeks to see how they progressed. By the end of the seventh week, all but a couple of the children could spell the food and animal words. All of them could sign most of our chosen words in ASL. On the video some

III :

children are caught literally looking at their own fingers for clues to the spelling. (See www.richlearning.com.) Their bodies knew how to spell before their brains could think out the sounds. I was and continue to be amazed by that.

For the third pilot project with RICH Learning, we chose 9 young Americans gifted in the arts to travel with me to Ethiopia. We also flew our best teacher in from India, Mercy Maan, to join us and advise, monitor and coach our teaching team. (See Mercy giggling on the floor, page 129) We interviewed 85 young Ethiopians and chose 20 as our cast and crew to learn along with us and 80 preschoolers at the Leadstar Academy in the southern city of Shashemene. This time, however, we did not invite any regular teachers into the mix.

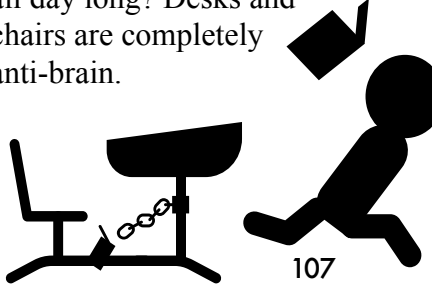
Everyone chosen was either a musician, dancer, theater person or visual artist from the start. (It's easier to teach a great musician to be a good teacher than to teach a good teacher to be a great musician!)

The results, again, were magical. None of the children spoke English as their first language, but all of them learned to sing and spell as they danced and learned with ease, speed, joy and retention. And yes, I lost another 15 lbs.

RICH Learning

In our fourth pilot project with RICH Learning, we traveled to one of the poorest counties in the United States, Allentown, SC. This time we added children up to age 12 to the mix. The results, again, were affirming and confirming. Children who normally would fall behind half a grade level during the summer due to lack of stimulation learned quickly and effectively using our RICH techniques of active learning.

In all four pilots of the RICH Learning philosophy – from the wealthy suburbs kids of Minnesota, to the rural poor in South Carolina, to city children of India and the town children of Ethiopia – we were confirmed in our suspicion of the benefits of adding muscle memory to music in the learning process. If exercise gives the body much of what it needs for both attention and retention, and if together with music it provides completely free and effective tools for embedding knowledge with OPERA (overlap, precision, emotion, repetition, attention) across the whole brain, body and environment (mind), why wouldn't we combine both music and movement at the core of the learning environment? It's not magic. It's not rocket science. But it is brain science. And it works. So why are our children sitting on chairs at desks all day long? Desks and chairs are completely anti-brain.



C.

Why Teach with Visual Arts?

"To gaze is to think."[25]

Salvador Dali

"Learning to draw is really a matter of learning to see – to see correctly – and that means a good deal more than merely looking with the eye."[26]

Kimon Nicholaides

In his book Brain Rules, Dr. John Medina, suggests we learn and remember best through pictures, not through written or spoken words.

"Vision is by far our most dominant sense, taking up half of our brain's resources. Visual processing doesn't just assist in the perception of our world. It dominates the perception of our world."[27]

In a neurological sense, it is not "the mind's eye" but the "eye's mind."

The Eyes Have It

The eyes are the most powerful and pervasive OPERA sense organ. Vision hits overlapping parts of the brain, involves the most precise measurements, triggers emotions, gives us a sense of clarity and comfort in its repetition, and focuses our attention.

Overlap.
Precision.
Emotion.
Repetition.
Attention.
Visual arts are OPERA.

In a landmark paper titled Hearing Lips and Seeing Voices, Dr. Harry McGurk proved how the eyes trump the ears on nearly every occasion.[28] If a subject watches the lips form one sound while a researcher is playing a completely different sound, the subject will literally hear the sound being mouthed rather than the actual sound being played.

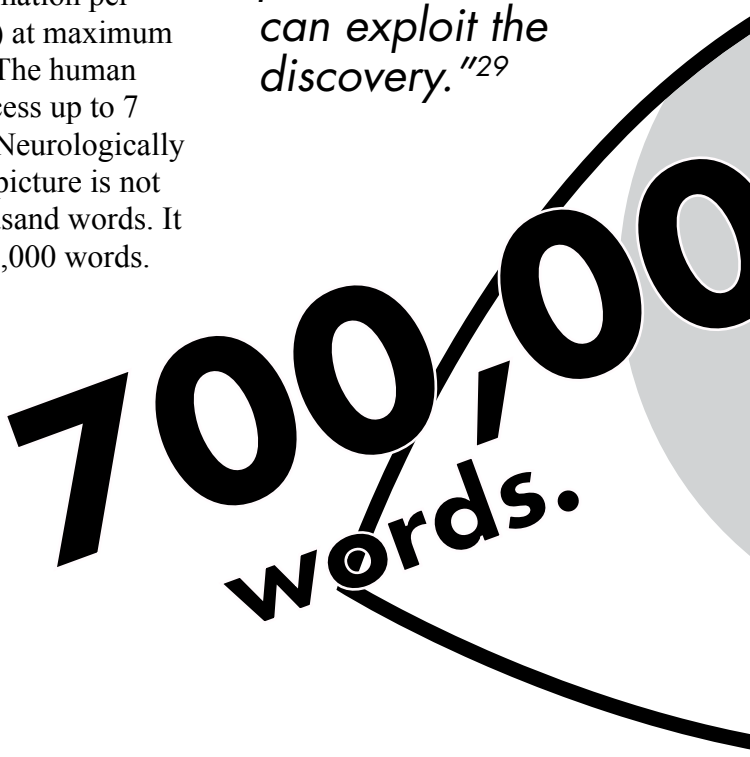
*Google "McGurk Effect" to watch videos explaining this strange phenomenon

III :

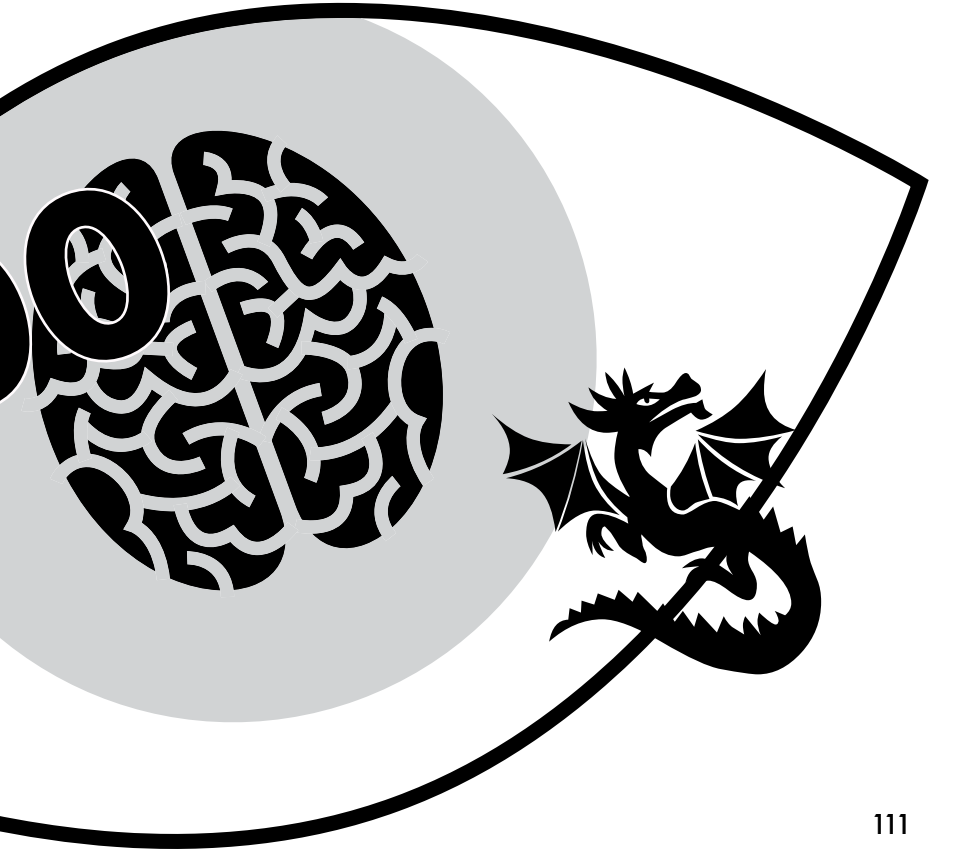
Seeing vs. Hearing

Visual art is always more attentive and retentive as a teaching tool than the spoken word. One of the reasons stems from the physics of sound versus the physics of sight. The human ear can process up to 10,000 bits of information per second (bps) at maximum bandwidth. The human eye can process up to 7 billion bps. Neurologically speaking, a picture is not worth a thousand words. It is worth 700,000 words.

"When vision deduces the shape of an object that gave rise to a pattern on the retina, all parts of the mind can exploit the discovery."[29]

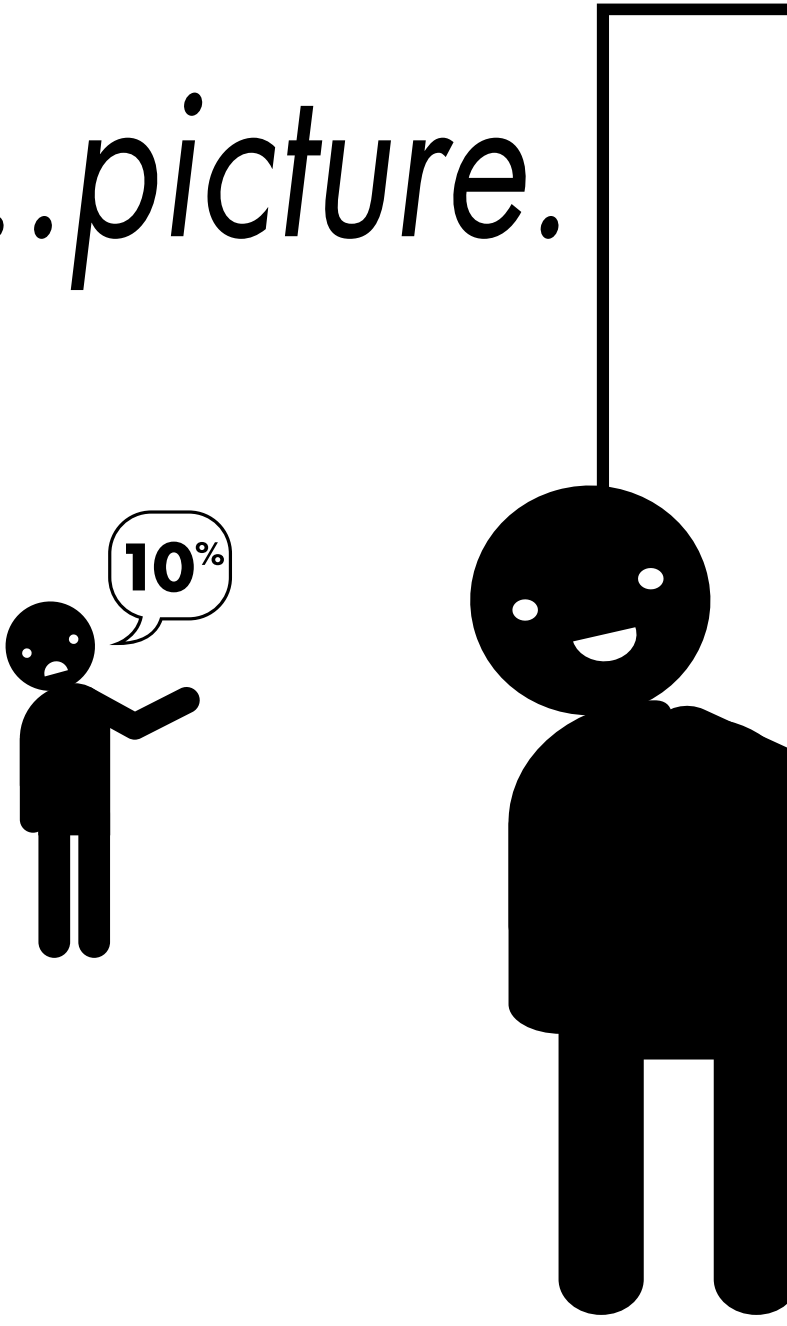


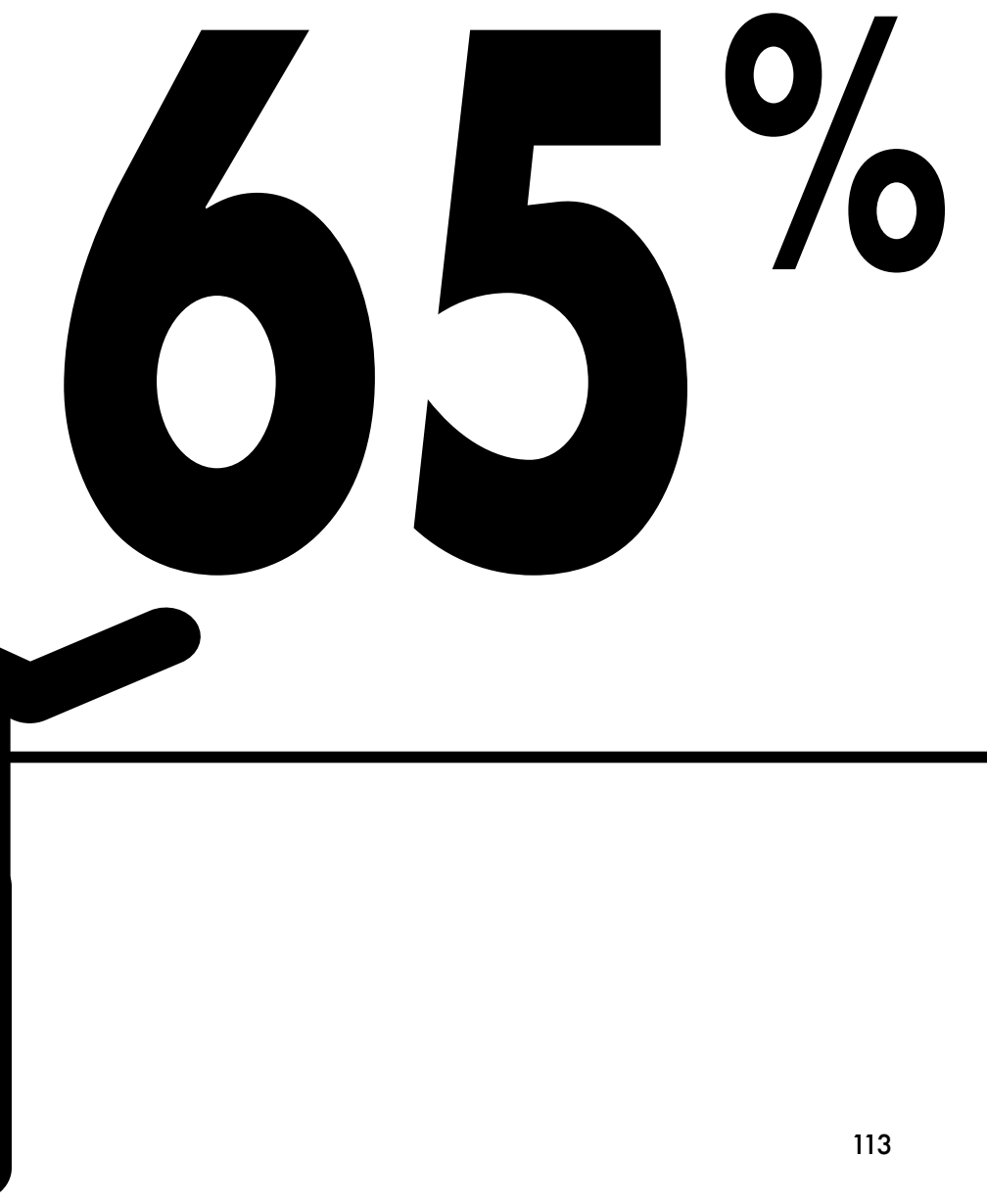
Dr. Medina compares memory tests done with pictures versus text and oral presentations. “Text and oral presentations are not just less efficient than pictures for retain-ing certain types of inform-ation; they are way less efficient. If information is presented orally, people remember about 10 percent when tested 72 hours after exposure. That figure goes up to 65 percent if you simply add a picture.”[30] You are 6.5X more effective with recall if you simply add a...



III :

...picture.




65%

III :

Why is art so effective in grabbing attention in the brain? Artist Betty Edwards suggests there are seven basic component skills involved in the creation and appreciation of visual arts.[31] Art involves seeing and mastering:

1. Edges

2. Spaces

3. Relationships

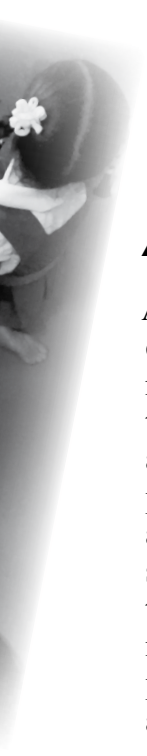
4. Lights and Shadows

5. Gestalt

6. Memories

7. Imagination

Any teacher employing art at the core of the learning process can harness all of these skills. And yeah, it doesn't cost a nickel.



Art and Patterns

Art connects to the visual cortex, but it does a lot more. Color, contrast, and the emotional content of art all create recognizable patterns. Karaoke letters and images flashing on a screen to repetitive songs that "pre-pete, pete, and repeat" the words, beautiful paintings inspiring the mind along with art that children create themselves – all these add a rich tapestry of memorable visual patterns to the learning experience.

A Whole Minder

Vision connects to an array of non-vision areas of the brain, body and environment. In Dr. Patel's definition of mind ("the brain meets the body meets the environment"), adding the creation and then the presentation of visual arts to music and motion and emotion at the core of learning is a no-brainer because it is not merely a whole-brainer. It's a "whole minder."

Bombarded with a sensual array of sight, sound, motion, emotion, fun, and meaning, the gatekeepers of the brain have no choice but to send the information you are trying to teach through from short-term to long-term memory centers. Attention. Retention.

Text and Texting

Not too long ago the word "text" was a noun. Today it is a verb. I learned my Greek in a day when the study of Classical texts in original languages was considered a rather precise science. The Greeks had six tenses, and I needed to

III :

"The most priceless art in the world is not found in the Hague or the Louvre or the Guggenheim. It is found on refrigerators."

Leonard Sweet

know how to master them all and parse verbs all the way out to the pluperfect. The Hebrew I learned appeared more of an art than a science. There were only two tenses in Hebrew. Any two Hebrew scholars might interpret the same vague text in completely different ways. Still, the text was something fixed on papyrus or page. It was something to be studied by scholars. Text was a noun.

Today "text" is a verb. It is a relational word involving communication, conversation, short bursts of thought shared and friendship. A text is not an ancient scroll to be dusted off and studied by book, chapter, verse, word and tense. It is a living invitation into a new conversation or a continued relationship.

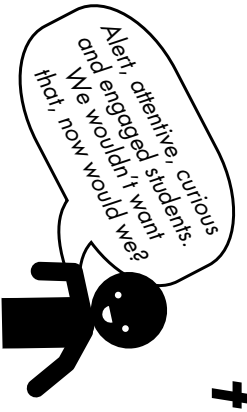
Children of the Gutenberg Era studied a text. Children of the Google Era send a text. You don't work on a text. A text works on you. It is an invitation into a conversation. Art is like that.

The word "educate" is an action verb. To educere literally means to "lead out" from ex - "out" + ducere "to lead" (like the word duke).[32]

Art not only draws expression out of the artist, it draws expression and conversation out of the audience. The word "audience" and "audio" come from the same root. With no art or visuals in the teaching space, you don't even have a spectator. A spectator has to have something to see.

Without art, all you have left is an audience: people relegated to the position of passive listeners. That might have worked for the radio generation, but it just doesn't work in the neo-Google world. Not at all.

III :



With art, they are drawn out and drawn in.

Why Art at the Core of Education?

There is another compelling, overarching neurological argument for using art at the core of education. The brain is overwhelmed with chatter day and night. But the noise outside is nothing compared to the constant cacophony and bombardment of billions of signals per second inside your head. The chatter of a hundred billion neurons is hard to silence. Art breaks through all that noise. It helps you focus. It has a way of involving significantly larger areas of the brain in attention, interpretation, translation and retention than talking and sounds ever could.

At worst, art engages the whole brain. At best, it engages the whole mind. The right side of the brain processes colors, symbols, pictures and relationships. The left side of the brain

processes words, sequences, and logical detail. The right likes to see the big picture. The left focuses on the parts. Striking, novel, shocking or curious art also has a way of getting the attention of the brain's curiosity centers. Chemically, this creates an anticipation event that activates multiple centers of the brain and floods them with alertness, attention and arousal neurotransmitters.

Art leads you out as it leads you in. It connects the whole mind in a cross-platform conversation. Art engages overlapping parts of the brain, involves precision, connects to emotion, creates pattern recognition and calls for attention. If one is to break through all the chatter and commandeer the attention of a child's brain (or any brain, for that matter), one must make a compelling, chatter-silencing case for the brain to focus upon. Art does that. It triggers the attention of legions of neurons in your cerebral cortex. When a portion of a group of neurons is stimulated, the whole neural set will fire and wire. You will both see and remember.

Leonardo da Vinci said, "I hear it and it's gone. I see it and it is there again. And again. And again..."

III :

Art is OPERA and opera is art.

Art works. Combined with music and motion and emotion, art works brilliantly.

If you only remember 10% of what you hear but 65% of what you see, if the visual cuts through the chatter of billions of bits of information bombarding the brain and helps the brain focus like words alone can never do, if you can see 7,000,000,000 bits of information per second but only hear 10,000 bits of information per second, and if art combined with music, motion and emotion can teach something today that may be remembered for a lifetime, why wouldn't the educational systems architect build art along with music and motion into the very DNA of every curriculum, lesson and experience?

Wait. Don't answer yet. There's more.

III :

D.

Why Teach with Theater?

"Good teaching is 1/4 preparation and 3/4 theater."

Gail Goodwin

We've designed a great platform for post-Gutenberg/neo-Google learning by mixing music, motion, and art. Let me suggest one additional tool that will pull all three together and make for an even more powerful neurological stage for connections and joy in learning: theater.

We can get to the child who doesn't want to learn anything through play. We can get beyond gate keepers and defense mechanisms in the brains of both children and adults by adding comedy, drama, improv to the mix.

As Shakespeare wrote in Hamlet, Act 2, Scene 2:

"The play's the thing where by I'll catch the conscience of the king."[33]

I recently visited a children's cancer ward in Cairo, Egypt, to paint with children and learn more about the work of my friend, UN Goodwill Ambassador Dr. Manal Etewah, and her Art2Care* project. Dr. Manal and her many volunteers bring joy, hope, creativity, expression and healing to children with life-threatening diseases in the Middle East. Her staff brought me into a room where a little boy named Said was lying motionless in bed with a chemo drip in his arm. He was frail, bald and afraid. His eyes stared blankly into space and he didn't acknowledge me. I touched his hand lightly, then told the nurse to tell Said, "This guy thinks he can do something you can't do." I smiled, took off my coat, and promptly stood on my head, calling his name. He rolled his eyes, smiled and looked into mine. He shook his head as if to say, "this guy's crazy!" We connected.

The play's the thing.

**Visit Dr. Manal's Facebook group at www.facebook.com/Art2CareEg*

EPIC

Why does theater work as a teaching tool neurologically? For starters, it engages the brain, the body and the environment automatically. Thus, it reaches beyond the brain and harnesses the mind. It is by nature OPERA, with overlap, precision, emotion, repetition and attention firing and wiring all the time. Even better, it gets the student ready for the teacher to appear. And sometimes we are surprised when the teacher is... us. Getting out of our spectator seats and onto the stage creates the kind of post-Gutenberg/post-television/ neo-Google experience my doctoral mentor Leonard Sweet calls EPIC:

- Experiential
- Participatory
- Image-Driven
- Conversational

Play allows us to take an audience whose minds may be completely closed and educate them (educere = lead out) to the place they might never travel on their own. Great theater involves both performers and audience in imagination, story, and deep metaphor when they enter the story together. Entering the story may lead both actor and audience to a new level of understanding.

"Drama involves pretending in a variety of situations. It helps children develop imagination, language skills, cooperation and other social skills, confidence, and creative expression."[34]

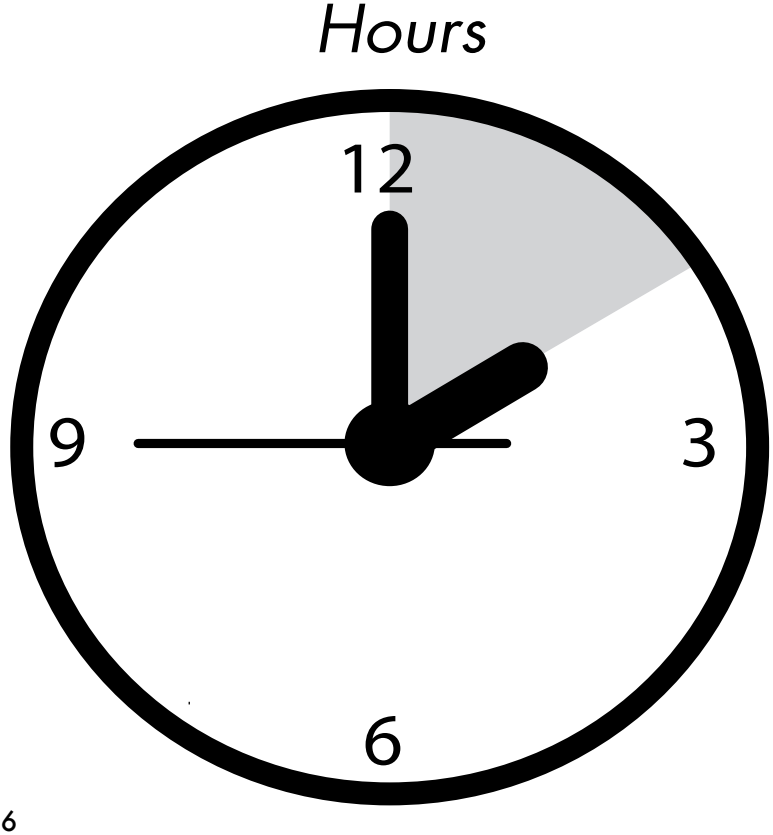
III :

A Brief History of Attention Span

RICH Learning

Pre-TV

In the pre-television era, a gifted orator could hold audience attention by virtue of talent, passion and eloquent story telling. The attention span was literally...

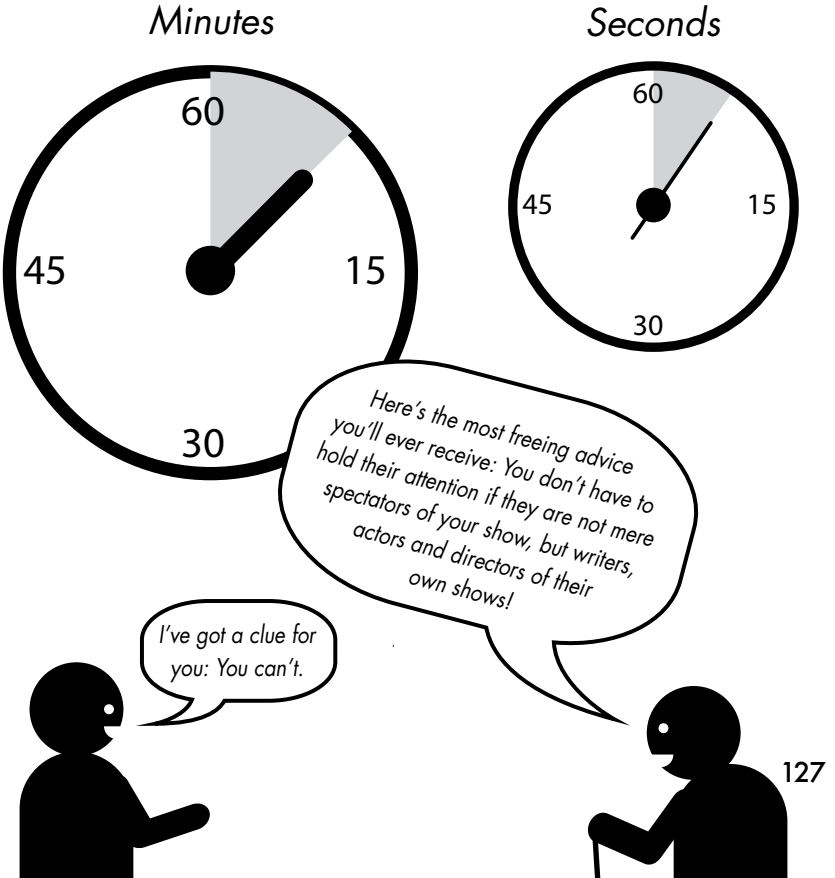


TV

In the television age, a network could count on a 7 ½ minute attention span before the audience was conditioned to look for a commercial break. Then came the remote control and MTV, which cut the seconds in thirds.

Net

In the TGIF world, a communicator may have mere seconds before the audience clicks away physically, mentally or emotionally. How can anyone be a teacher in this world if they are doing all the talking?



III :

You are never bored if you are the teacher, the actor, or the presenter. You are only bored if you are the spectator and the show isn't good enough. If this is the case, and there exists today a whole new generation who won't sit for even a few minutes to watch YOUR show without drifting away – no matter how good it is – then it is time to rethink education with the students as the teachers, actors, and presenters in the drama of every lesson. Not just some of the time. All of the time. Not merely engaging ears and eyes of audiences and spectators, but engaging minds through engaging brains, bodies and environments. Turn their bodies into brushes and the world into a canvas. Let them teach each other how to paint.

"In the quality school, everyone is the teacher."[35]

Dr. William Glasser

The play's the thing...

III :

There will be drama in your classroom. No question about it. There will be comedy there whether you plan it and harness it or not. That's not the question. The question is, "Will the theatrics be intentionally planned as part of the learning experience or will they interrupt and impede your learning?" If you can recognize, identify, comprehend and harness the power of play and theater, you've got yet another Overlapping, Precision, Emotional, Repetitious and Attentive tool in your arsenal.

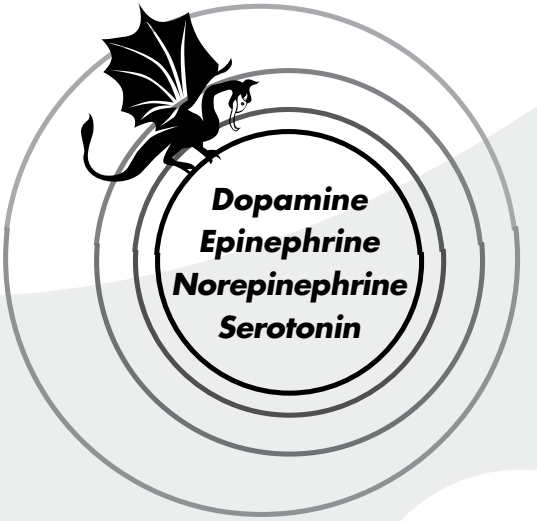
Drama is OPERA and OPERA is drama. Choose it. Use it. Empower it. It is priceless. And it doesn't cost a nickel.

Drama and Brain Drugs

Having fun with theater, enjoying an active acting out of a lesson along with friends, hearing the applause from parents, peers and audience – these events flood the brain with oxygen, glucose and BDNF, while lowering the toxic stress hormone Cortisol. They also provide a dose of at least four additional healthy brain drugs:

- **Dopamine** (the "pleasure/reward" neurotransmitter)
- **Epinephrine**(the"upper" neurotransmitter)
- **Norepinephrine** (the "vigilant concentration" neurotransmitter)
- **Serotonin** (the "mood-boosting" neurotransmitter)

Dopamine promotes energy, stimulates further neural growth, and increases positive attraction toward



I've got joy deep
down in my soul
I'm way beyond happy
I've got joy down in
my soul
Lifts me out of that
deep, deep hole
So happy, gonna lose
control
Never felt so wonderful
I've got joy down
in my soul

from the song "Joyful"
in the movie "Skool"
(www.richlearning.com)

the people and places where the affirmation occurs. Affirmation in this context builds a love of learning, increases bonding, and expands greater flexibility in the brain's executive attention system. Epinephrine helps the brain focus. Whenever epinephrine is released, its sister chemical, norepinephrine, rises throughout the body, stimulating the expansion of capillaries and fostering even more blood flow to the brain. Norepinephrine also creates better concentration and helps fix long-term learning by stimulating the amygdala and promoting positive emotional connections. Serotonin lifts your mood, enhances memory, aids in sleep, and improves cognition.

The result? More attention. More retention. More joy. More openness to learning. More fun. More creativity. More collaboration. Kids

III :

who take ownership in their own education.

Dress-ups, role plays, participation stories, creative movement, acting, improv, actual staged performances for parents and community – all of these feed the brain healthy chemicals and give children room to explore, blossom, grow, experiment, experience, and enjoy the learning process as actors and directors of their own learning, not as spectators and audiences in someone else's show. Theater and play build billions of healthy neural connections across the brain's learning systems. while adding joy to the learning process. A little fun, a little applause, a little recognition, and a little attention go a long, long way.

Education at its Best

True education has less to do with cramming information in and much more to do with planting a few good things in, connecting the new with patterns the brain already

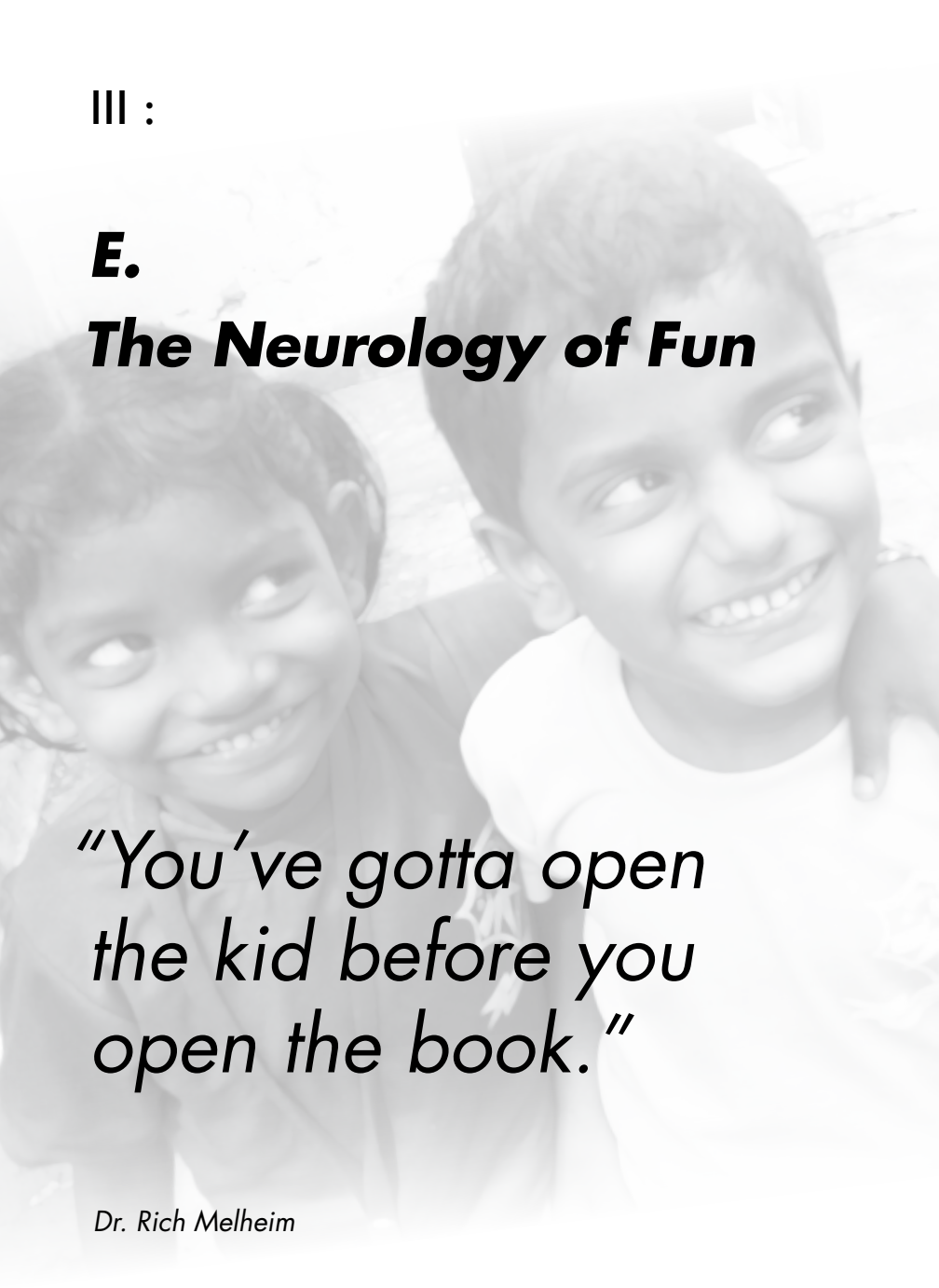
recognizes, then drawing out new understandings and interpretation. What makes something irrelevant, boring and unrecognizable? The lack of meaningful patterns and brain chemicals to promote the attention to and retention of patterns. What makes something meaningful and relevant? The recognition of multiple familiar patterns in a stimulated, engaged brain and the chemical cocktails that help the brain collect and connect them.

If activities which cause dopamine, epinephrine and norepinephrine to be released will be associated with pleasure and lead children to want more, and if acting out a lesson engenders both short-term attention and long-term retention, why wouldn't the educational systems architect design theater/play/performance arts into the very DNA of **every** curriculum, lesson and experience?

There is one more powerful neurological key which is absolutely free for you to leverage in the creation of your new teaching environment for the post-Gutenberg/post-television/ neo-Google classroom.

III :

E.
The Neurology of Fun



"You've gotta open the kid before you open the book."

Dr. Rich Melheim

Let's take a look at fun.

There's a simple but profound benefit you get by adding movement, motion, art and theater at the core of your learning environment. All of these tools help you "open the kid before you open the book." In addition to the oxygen, glucose, BDNF and other attention and retention neurochemicals you get while singing, dancing, arting and acting – the very act of watching your friends sing and dance and art and play makes for a tremendous amount of fun. Fun is not a four-letter word. For the teacher, fun is a powerful three letter ally. Fun opens the kid. Fun opens the brain. Why is this important?

Okay, here's a quick lesson on the fight or flight mechanisms in the human brain and why you should care.

There are basically five main neurotransmitters floating around in your head when you first walk into a new space:

- Adrenaline
- Noradrenaline
- Vasopressin
- Epinephrine
- ACTH

You don't need to know these chemicals. What you might wish to know is how they effect your attitude toward learning the moment you enter a new space. If you step into a room and your brain, body and environment all shout out: "It looks scary! It looks negative! I don't want to be here!" these five chemicals fix that negative impression in your brain within seconds and you are not going to learn anything from then on out. Nothing. Nada. Zilch. You literally don't get a second chance to make a first neurological impression.

III :

If, on the other hand, you walk into a new space and...

- Music is playing;
- People are singing and dancing and having fun;
- The place is lit, light and uncluttered;
- The colors, sounds and smells are welcoming;
- The first person who meets you greets you with a smile and your name...

...these five neurochemicals floating around in your head fix a positive message in your brain saying, "Yeah! I like this place! It's safe! It's interesting. I might even enjoy it and learn something today."

You've opened the kid. It will now be a breeze to open the book. Maximum learning can commence. This positive psychological, sociological, emotional boost then pumps a dozen or more additional memory-enhancing neurotransmitters like adrenalin, serotonin, and dopamine into the blood stream.

The Neurology of Fun

Here's what's going on inside your body when you are having fun with teachers and friends in a creative RICH Learning environment. Let's hop a ride on the Fun Train:

The auditory cortex registers the beat of the music and melody as the sounds of laughter and fun flood your brain with positive endorphins. The motor cortex in your frontal lobe connects to the internal gyroscope in the tiny bones behind your ears, which connect to your somatic

sensory cortex registering the location of your arms and hands in space in relation to your dancing friends. This connects back to your prefrontal cortex telling you how much you enjoy the experience and hooks to your cerebellum which coordinates movements. The visual cortex lights up while you watch everyone having fun and your corpus callosum engages both left and right hemispheres of the brain. Your hippocampus links up to create fond memories of the experience and tells the nucleus accumbens and amygdala to tag this learning event with a positive emotional reaction. The result? The train leaves the station and the whole brain is on board. Suffice it to say, whatever it is you want to teach, if you embed the learning in music, then add dance, sign, theater, art, and fun with friends, you'll be feeding the brain exactly what it craves. Neurons will fire together, wire together and the neurochemicals that wash and feed the brain and body will solidify the learning in place. Maybe forever.

If theater combines everything the brain needs for attention and retention, if adding music, motion, emotion, fun and friends to the play embeds something in the brain today that can be remembered for a lifetime, why wouldn't the educational systems architect design theater and play with all the rest of this into the **very DNA** of every curriculum, lesson and experience?

What would it look like?

What if we find a way to throw all these powerful brain-engaging arts together at the core of a single teaching platform? What if we call the audience and spectators out of their seats and onto the stage of their own learning theater using all four OPERA methods – music, movement, visual arts and theater arts? For starters, the post-television era classroom won't look much like a classroom at all. It will look more like a studio meets a dance class meets an art gallery meets a musical comedy theater meets a world. What kind of teachers would we need? What would the classroom look like? Would there be any chairs at all in the space? (Chairs are for spectators and audiences. Stages are for actors and directors.) Pull this off and you will be known as the arts center of the community. You will also be known as the school with no class.

All you really need for an asylum is a big room and the right kind of people.

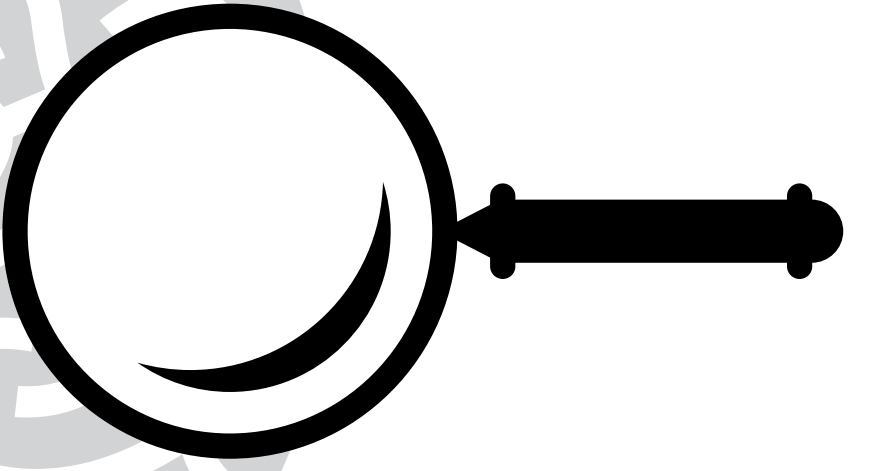
IV.

Memory and Meaning – Making the Micro and Macro

"Neurons that fire together wire together."[36]

Hebb's Law

It is time to get technical and equip you with the science to back you up when you face the certain opposition which will follow if you decide to change your educational metaphor from classroom to theater. Here's a quick crash course on what the latest neurology has taught us about the learning brain. We will do this on a molecular, cellular, and structural level to help you understand how the arts reach both minds and hearts more efficiently and effectively than nearly every other tool you currently possess in your educational bag of tricks.



The first thing you need to know is Hebb's Law. (left) Read it again.

Got it? Okay. Here we go.

IV :

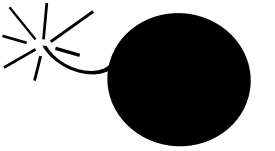
A.
Molecular Memory

Picture a nerve cell as a castle with a wall with a gate.
The gate is locked with a magnesium lock. You need two magic calcium keys for the memory gates to open.

That's how memory works on a molecular level. A spaghetti-like protein responsible for long-term memory potential called the calmodulin is the lock. This structure can't and won't open the gate to your learning at a molecular level unless there are two simultaneous keys placed into those locks. (It actually looks like a little gate to the inside of your nerve cells!)

Technically speaking, if you don't provide at least two keys to the locks, the doors won't open and release the ions that storm through the castle doors and flood the cells with the process of learning. (Technically it's called "long-term potentiation" but you don't need to know that for the test.) Suffice it to say, you've got to attack the castle with overwhelming force and use the right keys on the molecular level for long-term memory to have a chance.

How do you get those keys to unlocking the whole brain? Here's a clue. Knocking lightly on the cell wall gate with only one or two senses ain't gonna do it. You must **BOMBARD** the senses.



100 B

B. Cellular Memory

Your brain contains 100 billion nerve cells – as many as all the stars in the Milky Way galaxy. There are quadrillion connections between these neurons – as many as all the phone calls made in the world in the last twenty years. There is a physical pathway connecting nearly every part of your brain with nearly every other part. Not only that, but these neural connections extend far beyond the brain, itself, to every part of your body. There are two main kinds of nerve cells in this amazing maze of networks: Neurons and Glial Cells.

illion

IV: Neurons

Neurons (Nerve Cells)

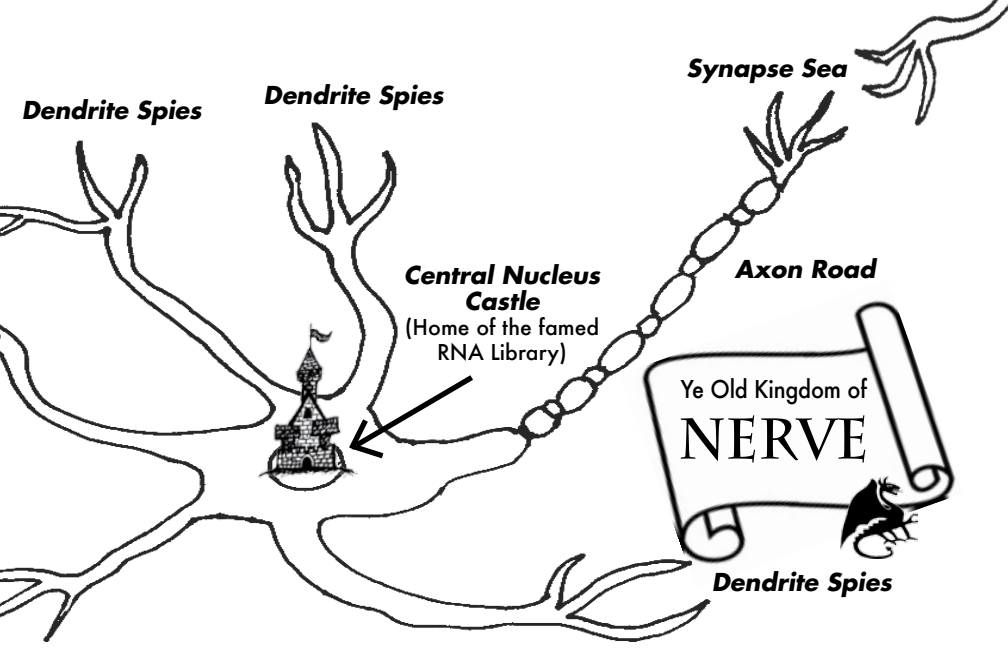
Picture a Medieval city state connected to a vast network of neighboring city states along a huge and complicated trade route of information highways, rivers and roads. At the center of government sits a castle housing an impressive library of governing instructions and secret codes. The city state has a network of spies that reach out like tentacles connecting to thousands of other city states in the region, but it is miserly when it comes to passing messages it receives on to others. Although there are thousands of roads coming in with messages, there is only one road going out.

This is a nerve cell.

Sound vaguely familiar? Before we go any further, reread the cartoon from the first pages of this book. Do it!

Good. Here we go.

The castle and center of government is the nucleus. Although the entire city state is surrounded by a cell wall, the nucleus is surrounded by its own wall to let only certain information in. (There's just too much information!) The networks of spies connecting this government to other city states are called dendrites. Dendrites connect the average nerve cell to over 10,000 other nerve cells. Some nerve cells are connected to as many as 100,000 other nerve cells. (That's a lot of spies!) The only road going out of the city state is called the axon.



Here's How It Works

Messages pass in and out of the nerve cell in the form of electrochemical exchanges that flash and fire at 100 yards a second. If the **Dendrite Spies** are given multiple strong messages from outside sources (sense organs like eyes, ears, nose, skin, etc.) or a lot of messages from internal sources (emotions, thoughts, feeling), they pass those messages on to the walls of **Central Nucleus Castle** with a code saying, "Urgent message for central command!" If these incoming messages are persistent and compelling enough, the gates of the inner castle open and the messages are passed immediately on to the keepers of the code books in the **RNA Library**. The RNA librarians decode these messages and determine if they are important enough to pass along to their allies in neighboring nerve cell city states down the line.

IV: Neurons

If the messages are deemed vital, a set of customized instructions is encoded in the library and sent on down **Axon Road**.

At the end of the Axon Road await little boats containing bags of chemical messages called neurotransmitters. These messages are released and dumped into the space (synapse) between our city state and adjoining city states. We'll call this space the **Synapse Sea**.

As the bags rupture, they release different kinds and quantities of chemical messages based on the instructions given from the RNA Library. These messages spill across the Synapse Sea between the sending cell's axon and the receiving cell's dendrites. When they reach the adjacent **Dendrite Shore**, they bond to proteins on the tentacles of the neighboring neurons and **BANG!** The electrochemical message from Ye Old Kingdom of Nerve has been passed on to the Dendrite Spies in the neighborhood and they continue on the journey toward conscious awareness at 100 yards a second.

Whew. Sounds like a lot of work just to tell you to swat a mosquito or not to step in the dog doodoo or to track down that deer footprint and turn your discovery into venison stew.

The dirty little secret about the difficulty of getting a message across to the brain is this: Most messages coursing through your body at any given moment are not registered consciously at all. The neurons, about the color of raw liver and the consistency of an avocado, are taking in billions

of bits of information every second, but the brain only has time to register so much. For instance, can you feel your socks right now? Hmmmm. Now that you think of it, you can. A moment ago you were feeling them, too, but the brain didn't bother to pay attention until someone told you to. Here's another test. Pause a moment and listen to the sounds in the room. Are you aware of multiple sounds around you? Hmmm.

Now that you think of it, you are. The fact is, you were hearing them all along, but because they weren't important until someone told you to listen, the brain blocked those sounds out. Some believe you are only consciously aware of 1/10,000 of all the information coming to you at any given moment. Too much information!

In most cases, it takes an overwhelming, multi-sensory bombardment of external senses connecting to meaningful pre-existing internal patterns already registered in the brain to get any message across to the bombarded brain. The more senses you add to this attack, the greater the odds the brain will pay attention.

IV : Neurons

Here's another strange truth: You don't just store memories in your brain. Neural signals are not confined to your head, but travel through an amazing maze – an information super-highway of unfathomable complexity and overlapping wiring – that stretches from head to toe. Memories are stored in every nerve cell in your body!

You actually have memories in your arms, your liver, your eyeballs, and your feet! In a very real sense, your brain extends to your fingertips.

If, as neuroscientists believe today, nearly every part of your brain is involved in nearly everything you do, then nearly every part of your body is also connected to nearly everything you think, feel, learn and experience. Memorization on a neural level is all about building, maintaining, and strengthening connections and patterns of connections between the neurons of the brain and body. The more connections – and the more repetition to solidify those connections – the better your chances of creating short-term attention and long-term retention of what you are trying to teach.

All the more reason to get the whole mind (brain, body, environment) involved in your learning designs.

Memories in your toes? Hmmm. Maybe that's why deep massage therapy sometimes worketh.

IV :

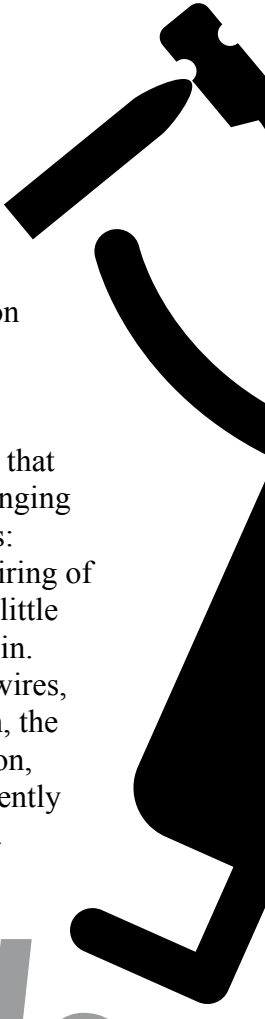
Glial Cells (Memory Glue)

Aside from neurons, an increasing amount of attention has been paid recently to another type of nerve tissue – a cell made from glucose that provides several maintenance functions for the brain.

These mysterious, yet abundant glial cells have been proven to serve a number of important functions in the brain. Glial cells:

- Provide structural support in the brain
- Lay down markers to tell nerve cells where to grow
- Facilitate waste removal, and
- Maintain nutrition in the brain

They provide one additional function that will relate to our singing and signing lessons: they insulate the wiring of the neurons with a little fatty sheath – myelin. As with electrical wires, the more insulation, the better the connection, and the more efficiently the wiring will fire.



Glial Cells


THIS
WAY
GLIAL
GLUE

"There's an ancient Chinese proverb that says, 'When the student is ready, the teacher will appear.'

From a neurological perspective, another way of saying that is, 'You gotta open the medulla before you open the brain.'

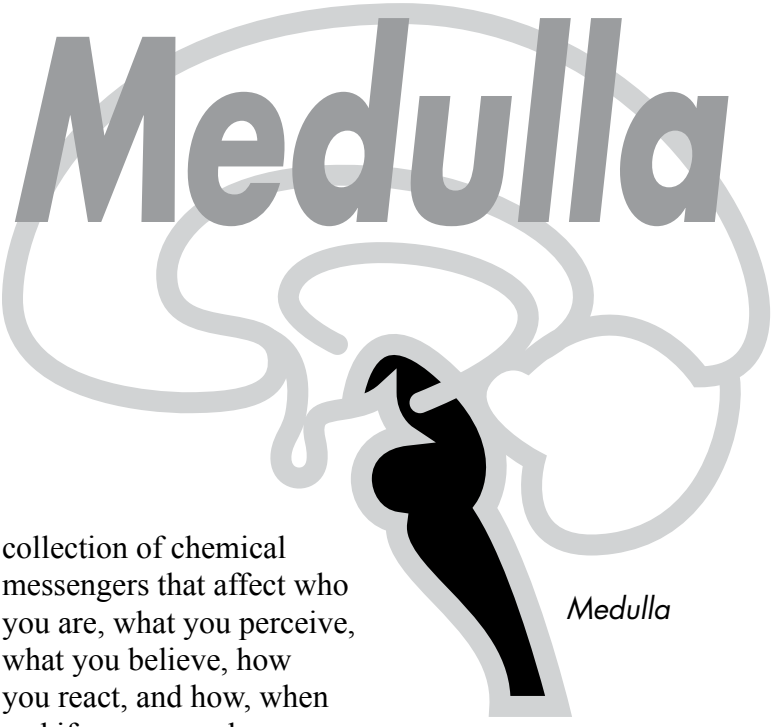
Just ask Maslow."

Dr. Rich Melheim

C. Structural Memory

The human brain possess a number of complex overlapping learning systems. An educational systems architect like you would do well to understand all of the tools and assets you possess in your learning arsenal before designing an optimal learning platform.

Let's talk in computer language for a moment. First, picture the brain as a system made up of three major computers mainframes, a number of smaller processing centers, billions of sensory input devices to process what you see, smell, taste and touch, and a miraculous



collection of chemical messengers that affect who you are, what you perceive, what you believe, how you react, and how, when and if you remember.

Mainframe I: The "Autopilot" Brain (Medulla)

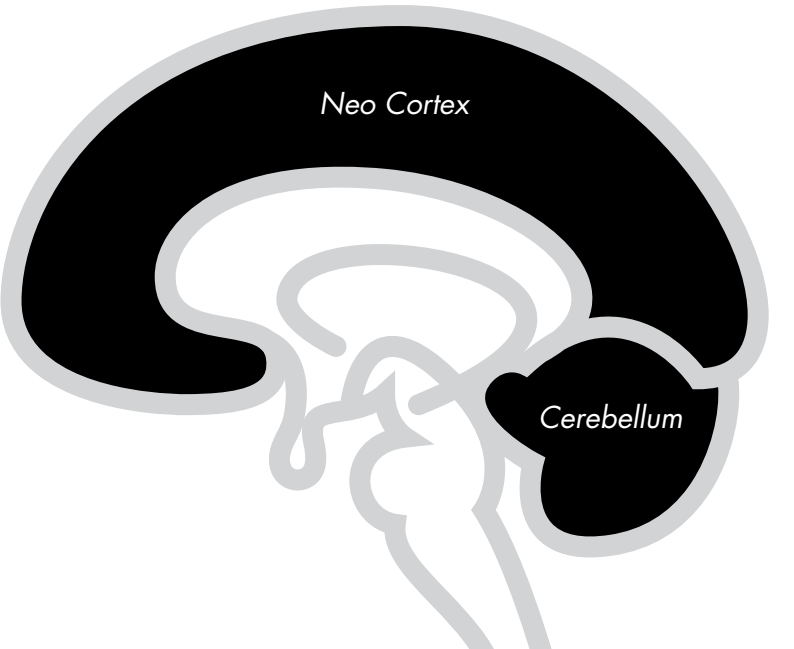
The brain stem, or medulla, is the non-thinking part of your brain. It automatically maintains and regulates pulse, blood pressure, temperature, and other vital signs. You can learn to tap into this autopilot through meditation, prayer and other focusing techniques, but it takes great concentration and practice to tell it what to do and how to behave. The easiest way to adjust it is through the cadence and beat of music.

IV : Cerebellum

Mainframe II: The "Emotional" Brain (Cerebellum)

The cerebellum sits above the automatic portion of your brain and houses your instincts, emotions and feelings. Your genuine smile or frown comes to you sponsored by this brain. So do hard-wired, ritualized movements like serving a tennis ball, driving a car or signing a spelling song.

Over the last decade, scientists have learned that emotions fire along the same brain circuits that govern social relationships and the processes of making meaning. Emotions are integrated with cognition, perception, and physical action. They affect not only the state of your body and mind, but they also enhance or impede your memory. Music has a profound power to set moods in place in this center of the brain.



Mainframe III: The "Thinking" Brain (Neo Cortex)

Crowning the top of your head is a wrinkled 1/2 inch maze of overlapping wiring called the cognitive or cerebral neo cortex. (neo = new; cortex = bark) This mainframe takes in most of your sensory information and controls the majority of higher thoughts.

It decides whether or not it is appropriate to feel as bad as you do; whether or not you should act or refrain from acting based on your best interest; and whether or not you give a rip about what the teacher is saying if it doesn't appear to have relevant or meaningful patterns connected to your life. This "thinking brain" serves as the long-term memory hard drive and retrieval system for all that you think you know, and much of what you actually do. The neo cortex is made up of two halves called the left and right hemispheres.

The left brain works faster than any computer in the world and loves to process details. It controls complex voluntary movement and calculations, while the more artistic and intuitive functions are performed better by the right half.

The right carries with it a sense of the whole as seen separately from its parts. It is spontaneous, innovative, creative, and able to modify mid-course. The right half of your brain sees the forest. The left half sees the trees. (And in some people, the bugs on the trees.)

IV :

The Big Body

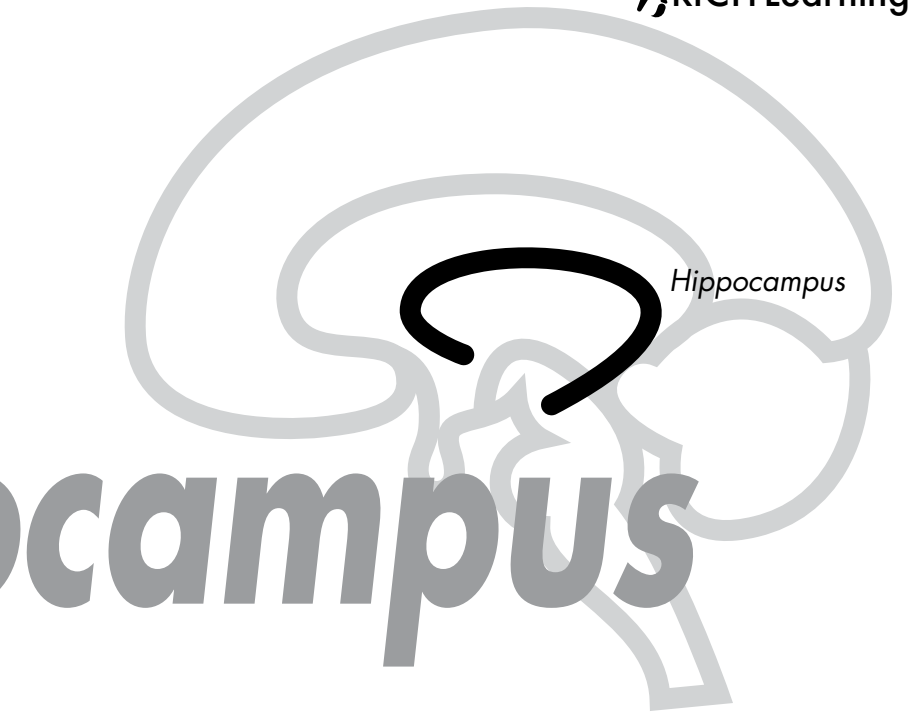
Sitting between the two halves and connecting them together to make sense of the world is a big body of wiring called the corpus callosum (corpus = body + callosum = big in Greek). The more these two sides of the brain talk, the more firing and wiring takes place between the two. This promotes thicker connections, deeper understanding and a brain more ready and able to act, react, create and innovate.

Hippo

Processor I: The Short-term Scratch Pad (Hippocampus)

Tucked between the two hemispheres of your brain is a seahorse-shaped apparatus called the hippocampus. The Greeks thought it looked like a seahorse so they named it the hippo = horse + campus.

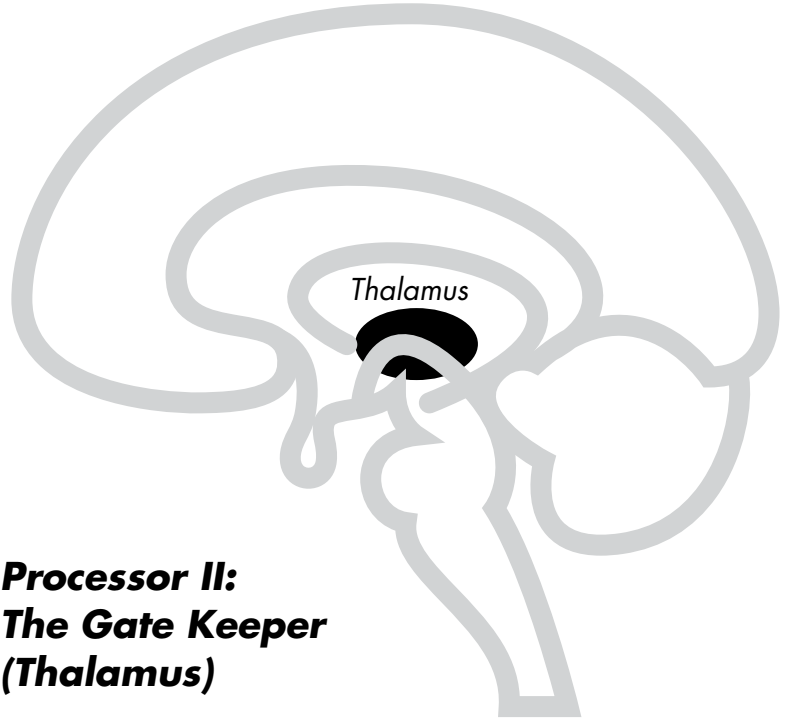
This ingenious little factory turns current events into storable memories by grabbing baby stem cells, converting them to brain cells and writing the code of the new event, experience or learning onto it. When you first see, feel, taste, touch or experience something new, data is written on these babies, then sorted, classified, and



stored for a while in the short-term memory center. The moment you repeat a new learning, these baby cells get stronger. Bonds between neurons branch out and thicken. The new information begins a long journey from the hippocampus "scratch pad" toward the long-term memory centers of the neo cortex. Learning something new, then repeating it a short time later, is a powerful way to begin moving what you just learned from short-term memory to permanent storage.

Learn. Review. Repeat. Learn. Review. Repeat. That's how to strengthen the babies and give them a chance to grow strong enough to live.

IV :



Processor II: The Gate Keeper (Thalamus)

Aside from the guard posts in every nerve cell, there is a guard at the door of your brain's long-term memory center. This guard, called the thalamus, controls what goes in and what goes out of the neo cortex. It is not merely a relay station. It serves as a checkpoint to the deeper brain. The thalamus is a discriminating gatekeeper. It has to be. Billions of competing messages bombard it every second of your waking and sleeping day. Most are blocked out. Only a few chosen ones get through.

Thalam

Estimates are that you are only consciously aware of 1/10,000 of the information that assails your brain every second. Without a good guard at the gate, you likely would go mad with sensory overload. Too much information!

How do you get a message beyond this gatekeeper to the deeper brain? How do you convince it to allow information through to long-term memory? With all of the competing chatter going on in the wiring, you've got to attack the guards with overwhelming force. (i.e, lots and lots of sensory stimulation.)

Your only hope of getting through with whatever it is you are trying to teach is by creating a massive multi-sensory attack on the guard posts of the brain.

IV :

The more senses you employ and the more convincing, compelling, challenging, novel, coherent, curious, pattern-driven sensory messages you can muster, the better the chances your message will get through.

It is the continual synchronous bombardment and stimuli from a variety of sense organs that pounds on the doors of the thalamus – the sensory gateway – and yells "Listen to this!" and "Let us in!"

It is only when a lot of persistent, unique, powerful messages assail the gatekeepers that you have the best odds of getting through to short-term attention and long-term retention.

You've got to hit it with your best shot, then hit is again. And again or you don't have a chance.

If you try to get through to most children through their ears alone, you may be wasting your breath. Most of what you say will go in one and out the other.

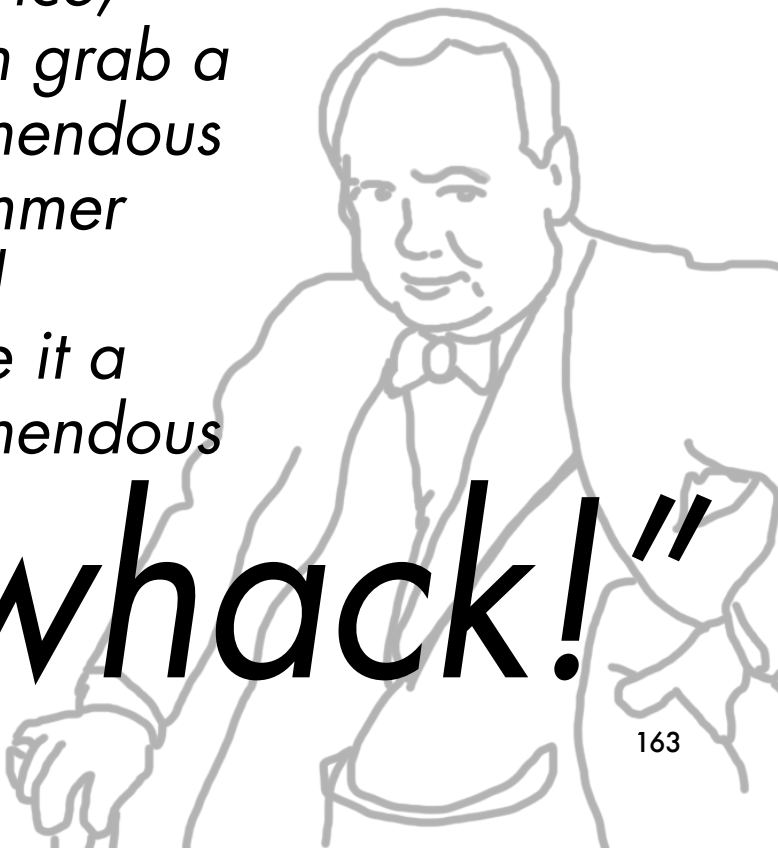
If you show a interesting picture while you talk and, thus, light up the visual cortex with 7,000,000,000 bits of information the eyes offer to the brain to process each second, you have a better shot attention.

If the child can see the lesson, hear the lesson, taste, touch and smell the lesson, now you've got a chance. If the learner knows they get one shot at hearing the lesson and they're going to be teaching it to someone else five minutes later, now you may have a real chance at both attention and retention.

As Winston Churchill said:

"If you've got a point to make, make it once, make it twice, then grab a tremendous hammer and give it a tremendous

whack!"



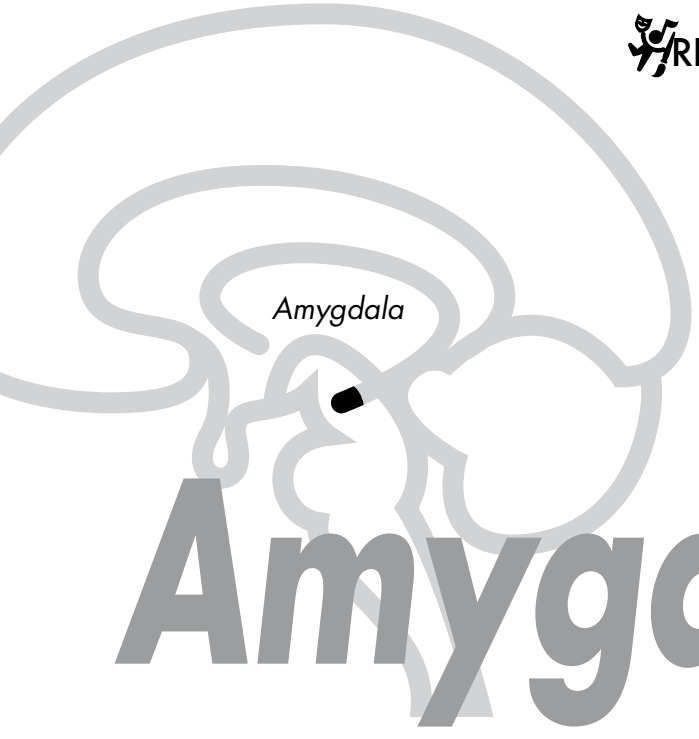
IV :

Processor II: The Emotional Filter (Amygdala)

Emotion and memory are more connected than most people think. The reason for this is an tiny little almond-shaped structure called the amygdala. (Amygdala is the word "almond" in Greek.) Connected to most areas of your brain – especially the advanced sensory processors – this fingernail-sized dynamo actually selects and tags those experiences your brain will choose to remember.

You are not going to get through to the brain if you don't get through to this emotional center. Otherwise, the brain will ask "why should I care?" and dump the messages before they have a chance to register. Remember "You gotta open the kid before you open the book?" Another way of saying it is, "You've got to open the amygdala before you open the brain."

If you don't get through to the amygdala before you start teaching, you may be wasting your time and breath. Messages that don't pass the emotional "why should I care" test are received like the adults in the Charlie Brown tv specials. They may be saying something they think is important, but the brain is hearing only "wah wah wah wha wha wha." Only those messages and events that connect strongly with the emotions will unlock the magnesium locks (remember the calmodulin?), get



Amygdala

transferred to and through the short term memory center and marked for future recall in the long term memory centers.

Some think the amygdala is the one part of the brain that never forgets. Your earliest fears, impressions, and pleasures are nearly impossible to dislodge from this emotional center of the brain. For this reason, you want to design all initial emotional exchanges within your children to be positive, affirming, direct, fun, and creative. You don't get a second chance to make a good (or bad) first impression when it comes to the amygdala.

You'd better make the first shot count.

IV :

Sensory Input Devices:

The body may have five major input devices (eyes, ears, nose, mouth, skin), but it has billions of listening posts and relay stations. Those devices are sending information to central command at every millisecond. You want depth in learning? Increase the number of neurons involved in your learning process by engaging every sense in recognizing, identifying, comprehending and harnessing the RICH Learning.

You want short-term attention and long-term retention of the materials you are teaching? Increase the number of synaptic connections between those neurons. Sing the lesson, dance the lesson, draw the lesson, act the lesson. Add form and color to the lesson. Taste the lesson, touch the lesson, smell the lesson. Every sense you add to the experience adds depth and meaning to it. Enlist and link up billions of listening posts and relay stations. Spin around the moment after a new piece of information has been taught and immediately ask student to teach the lesson to others. You will begin hardwiring the information into their brains on the spot! Ask learners to re+congnize what they have just cognized for the first time. Ask them to identify the parts. Ask them to comprehend what it means so they can help someone else comprehend it. Ask them to harness the essentials and teach it to another. Now you have given your brain the most compelling reasons of all to store and retrieve the information for later use. You don't simply have RICH Learning. You have RICH Teaching!

Senses

Your brain may extend to your fingertips, but your mind literally extends to the edge of the universe.

And beyond.

IV :

The Exobrain (External Hard Drives)

When it comes to the brain and the mind, this may be the strangest truth of all: If, as Dr. Ani Patel says, the mind is "the brain meets the body meets the environment," then you may own a number of external hard drives outside your own skin where you store many of your least retrievable memories.

Every family member and friend from childhood is one of your external memory devices. Every experience and environment you enter is part of your external storage capacity. Every smell. Every poster. Every taste. Every touch – it's all part of your memory apparatus. The keys to some of these memories, however, don't happen to be stored inside your head.

You literally store, connect, have access to many of your memories in the faces, smiles, voices and body movements of your loved ones and friends. Without them jogging your memories, you don't and won't have access to much of your own past. Your mother is an external hard drive. Your dad. Your siblings. Your dog. The letters from your grandma. The letters in the dew-dropped leaves. Your photo albums. And yes, the letters, bookmarks and pages of your favorite books. They are all part of your context for identity. Without them the content of your life is very poor, indeed.

In the ancient world there was a punishment

worse than death. Banishment.

The ancients understood that apart from your people, your home, and the memories, rituals and traditions they stored for you, you were severed from your identity. You were the walking dead.

When people are told under hypnosis that they have no future, most of them laugh. When they are told they have no past, most break down and weep. Your past matters. Your friends matter. Your memories matter. You store who you are there.

If Dr. Patel is correct and the mind is "the brain meets the body meets the environment," and if you indeed store some of your best memories in the "exobrains" of loved ones, then losing a mother is – in a very real sense – losing memories you will never, ever retrieve again. Losing a loved one is like losing an irreplaceable piece of your memory access, and thus your mind.

When my dad buried his five brothers and sisters one by one, he lost a little piece of his mind with each funeral. When he buried his wife of 52 years, he lost a fortune in irreplaceable, inaccessible memories. He lost a major piece of his mind.

There are memories, facts and bits of information you store and only have access to outside of your self. These people, these sacred spaces, these special places are the holy holders of your memories.

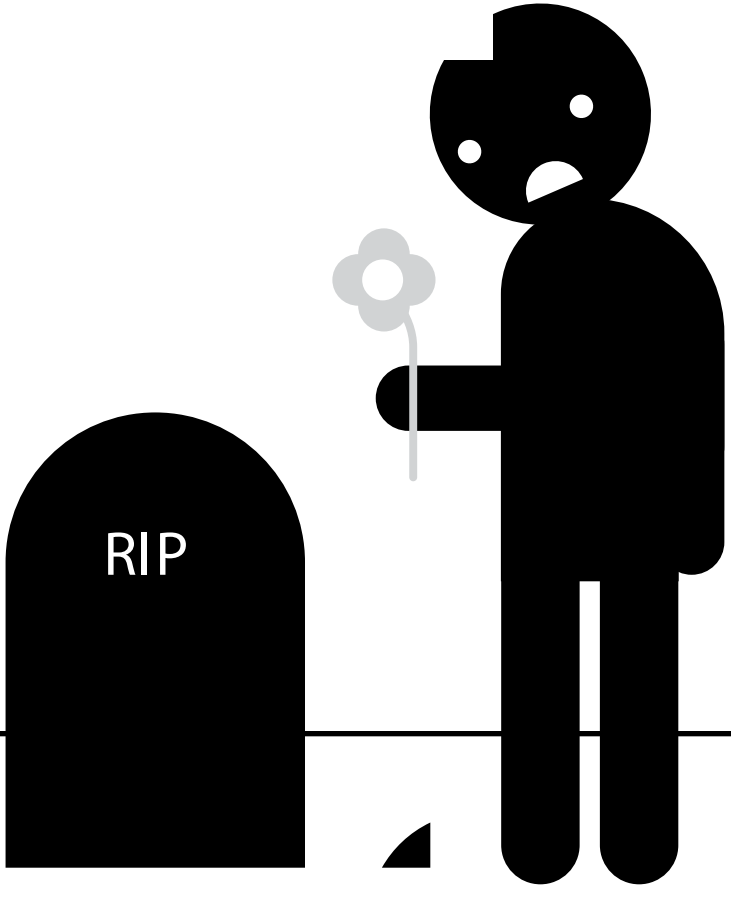
They are your exobrain.

Losing a loved one is, by this definition, losing a piece of your mind. You may never have access to those memories again. My advice to those facing loss:

Spread and store your dreams, your hopes, your life, your memories, your love across a vast array of carefully chosen people and places and causes. Tell your stories to children, and ask them to share their dreams and hopes with you. Create new stories together, new memories, new bonds. These new friends and experiences will carry a part of you for you when you cannot carry yourself. They will remember for you long after you have forgotten. They will hold you when you cannot hold yourself. And that living part of you walking on the outside of yourself may one day return to rebuild the broken parts of you inside: parts of you that you may not be able to rebuild on your own. That living part of your story which you store outside yourself in the hearts and arts and minds of those you love may even continue to bless the world long after you are gone.

Spread your memories, your life, your love around in the lives of the young and, in very real sense, a part of you – the best part – will one day walk away from your own grave.

RICH Learning



V.

Every Lesdyxic and ADD/ ADHD Child Should Be Drugged

Einstein must have been a moron. He didn't think like other kids. He couldn't pay attention. He didn't have ADD. He had ADDDDDDDDDDD. He should have been drugged.

Edison must have been a moron. He could barely read. He didn't have dyslexia. He had lesdyxia. This moron went on to invent the light bulb, the phonograph, an early form of what would become the video camera and about 1000 patents. He probably should have been drugged.

Leonardo must have been a moron. He wrote backwards. He saw things in pictures, not words. He saw things in things no one else saw. He saw things that weren't there. Or weren't there, yet. Seeing things that aren't there – is that madness or genius? Maybe he should have been drugged, too.

Ritalin. Adderall. Wellbutrin. Vyvanse. Yeah, that would have fixed them.

But wait. Who has the disability: The kid who thinks like everyone else or the kid who thinks like no one else? And who should be drugged?

When I was young I drew picture books and narrated stories to my mom, who diligently wrote the words down for me. My first book was about a duck who couldn't quack. By the end of the book, it turned out the duck could quack after all. He just chose not to. (Yeah, that's me asleep on the floor illustrating one of my first books. Cute kid, huh?) When I arrived at school a few years later, I found myself leaving the regular classroom to attend special reading classes three times a week. I just couldn't read like other kids.

I somehow saw the scratchings on the page as pictures, not as letters. I managed to translate the symbols into sounds eventually, but I simply could not read out loud. My brilliant and kind special ed. teacher (who I don't remember but I'll never forget) didn't think I was stupid. Just because I couldn't read like everyone else, she didn't make me feel dumb. She stuck with me and one day noticed my eyes were darting all over the page as I tried to read aloud, jumping way ahead of the words that were coming so slowly and painfully out of my mouth as I struggled. She finally told me to SLOOOOOOOOOW DOWN and finish the text before me prior to moving on to the next.

Slooooooow down.

V :

Maybe I should have been drugged. If I were five years old today, I probably would be. Slow down? I have had that very problem all of my life, and it sometimes frustrates my wife, kids and friends to no end. But is it a problem? Or is it a gift? And slow down?

I spoke recently about RICH Learning in Columbia, MD. Following the event, a 30-something African American NSA officer with the greenest eyes approached to share a story: "We moved with our two boys from Indiana a few months ago and enrolled them in a well-respected neighborhood school. Within a couple weeks the principal called us in and suggested we put the boys on drugs for their attention problems. I was surprised. They were active boys in their school back home, but no teacher had ever suggested drugs to slow them down and help them focus. I turned to leave, then stepped back with a question: 'What percent of the boys are on attention drugs in this school?' 'All of them,' the principal replied. We pulled the boys from that school the next day."

First, let me say this about attention drugs. For some kids with learning problems, attention drugs have been a God-send. There. I said it. Second, let me say this:

I believe every child with ADD/ADHD should be drugged.

I simply disagree that you need to pay a nickel for the great and effective drugs already available to you free of charge. These drugs are freely dispensed when you sing, dance, play, make art and have fun with friends while you learn.

Third, an observation. Maybe we shouldn't be so quick to try to short-circuit the short-circuits of dyslexia, ADD/ADHD and other "problems" that seem epidemic in our schools.

What's wrong with energy? Energy is in low supply and high demand all around the world. We absolutely need **MORE** energy in our schools and in our world today, not less. Do we really wish to dampen and subdue the many gifts which accompany a restless young mind? It is restless discontent that has fueled many of the world's best inventions, innovations and social progressions. It is often the strangest, quirkiest people with the weirdest ideas who have pounded the impossible into the realm of possibility and collided their wacky wonderings up against the status quo to propel the world to richness. A brilliant idea may not be deemed brilliant until some idiot calls the inventor an idiot and forces that idiot to focus on how to make the impossible possible. We desperately need the energy, the different, the weird in this world. It leads us to wonder, to wander, to plunder, to ponder. And that wonder often leads us to the wonderful. Funderful. Thunderful.

Maybe it is we, ourselves, whoshould**sloooowdown** and take a serious look at the gifts that flow from the child who doesn't quite fit in and can't sit still. It may that this child, if properly channeled, could literally change the world one day for the better if we but help them recognize, identify, comprehend and harness their gifts with the focus that comes along through brain-based learning on arts-based platforms.

V :

My Reading Dis-Ability

Back to my reading problem as a child: Maybe I should have been drugged. I was going too fast. It wasn't until I rolled off the back of my parent's station wagon tail gate into a ditch at 30 mph and cracked my skull at age 10 that I finally slowed down. I spent the summer of '65 in bed reading comic books and listening to mostly classical music on my parents' little plastic record player. I emerged from the basement bedroom that fall a better reader and a more polished cartoonist with Beethoven, Bach, Mozart, Mancini and Bacharach buzzing around in my head. One side effect of that summer of forced seclusion was this: I could hear classical music playing in my sleep, even when the records weren't spinning. I could hear music in the hum of the car engine when I closed my eyes and stuck my head under the dashboard on vacation playing Mercury Spacecraft astronaut. (No seat belt laws). Sometimes it was classical music that played in my head. Sometimes it was music that didn't exist. I could hear point/counterpoint. Contrary diatonic progression. Strings. Brass. Percussion. My brain began to take the richness of what had been wired into it, and started making up its own symphonies. And guess what? That's another amazing quality of the human brain and a crazy creative benefit of RICH Learning. Once you embed enough good stuff into the human brain and hardwire the patterns of the content, the brain takes over and starts composing its own original thoughts, original combinations, original works. With enough good

raw materials hardwired in, the brain becomes very creative. It happens with music. It happens with words. It happens with art, dance, math, language, science. It happens with everything you put in if you simply embed it in a rich way using the Arts. And it can happen with any kid in the world in spite of, and sometimes because of, any weird way their brain happens to be wired.

To this day I still have the challenge of trying too much, doing too much, reaching too far and exhausting everyone around me. I literally bounce out of bed in the morning with no alarm clock needed, excited to attack the day. To this day much of my world is still trying to tell me to sloooow down. I'm often already into tomorrow before I finish today. I'm often already in the next book before I finish this one. (By the way, I usually read three or four books at a time and nearly always start a book from the back, working forward... to see if it holds my interest at all.)

I often see the whole picture of a task, of a job, of a problem along with its a solution before I can explain to anyone what I think needs to happen next. I often see the end before I can explain to anyone how to get there. I often see a dozen chess moves ahead before I am able to explain or convince those around me the details of the very next move and why it should be taken. Is that a problem? Seeing ahead? Yes. Is that a disability? I don't know.

You tell me.

V :

Hunting Maryanne

To this day I don't read like other people. I see pictures and have to translate them into meaning. I still have a problem reading, but only if I don't hold a pen in my hand to make notes and draw cartoons and ask questions while I read. To this day I find it thoroughly enjoyable marking a good book black and blue with ink, and engaging in conversations with the author throughout.

I have actually made marvelous friends of writers over the years simply by mailing their books back to them, marked black and blue with questions, thoughts, quotes, and random cartoons that came to me while I engaged in the book. That's how I met and befriended Dr. Maryanne Wolf, the brilliant and wonderful dyslexia and reading specialist from Tufts.

I marked her book Proust and the Squid: The Story and Science of the Reading Brain full of ink, dropped it in the mail in a manila envelope with a post-it note saying, "We have to talk" and received the following note back with the book:

To Richard, who undoubtedly earns the title of my most interesting "ideal reader." I am in wonder and awe at the ways you have so clearly used your deep reading skills with my text. Your notes are an author's dream.
Kindest wishes,
Maryanne Wolf, Tufts

Deep reading skills? I'm the kid who couldn't read out loud. I was intrigued.

Dropping by Maryanne's office at the Center for Reading and Language Research at Tufts in Boston, I was blessed by the opportunity to read the author, not just the book.

That chat in her office led to a video interview on "The Meaning of Meaning in a post-Gutenberg/neo-Google World." (See pages 220-221). That interview and one with Dr. Ani Patel, author of Music, Language and the Brain, led to multiple dinners with Ani, Maryanne and Dr. John Ratey, author of Spark: The Revolutionary Science of Exercise and the Brian at Harvard. Those dinners led to an introduction of Maryanne to Ani, which led to Maryanne getting both Ani and his wife teaching offers at Tufts, which led to a research project on the phonological advantages of percussion and reading. All that led to me wondering if even a poor child could get a rich education if we simply:

- **Teach** the way the young brain learns best
- **Employ** the tools the young child loves most
- **Engage** primary caregivers every night in every home,
- **Leverage** the best tech available as teaching assistants, and
- **Train** and pay teachers at a higher level

Maryanne's book led me to one more thing: the RICH Learning concept. As the friendship grew, I asked Maryanne in an email one night: "Is this the way we learn everything? First we **R**ecognize, then we **I**dentify, then we **C**omprehend, then we **H**andle?"

Maryanne's response?

Dear Rich and Colleagues,

What an extraordinary letter at so many levels! I need to add a few things, however, before you decide exactly how to describe your RICHness. By and large you have the cognitive/perceptual/linguistic operations correct in **Recognize** (a letter or letter pattern or word),

Identify (a little trickier here---you are identifying, but you are connecting the visual to the phoneme or sound information), **Comprehend** (yes, and here it is multi-layered, because you need to comprehend the Meanings and Grammatical Uses of words and their role in the text, and, of course, a great deal more which is the H). It is the H that I would not call Handle, but **Harness**. The child and the expert reader need to bring to bear or Harness all that they know that is related to the text information, and then----here is Proust's insight----go beyond the information to their own insights, creative leaps, inferences, etc.. I would much prefer Harness, if you want an H, than Handle.

All of this indeed does happen in less than half a second. The exact circuitry will differ with the writing system, the age and stage of reading development, the medium used (my particular Cassandra worry With Twitter mediums). Don't try to "Hook" your RICH to specific brain areas. That would be either too reductionistic (if you make it simple to understand) or too complex, particularly since our knowledge here is evolving all the time.

A final thought that is quite different. As some of you know, my colleagues and I at MIT are attempting to create a tablet "learning experience" for children in remote regions of Africa who have no access to schools or teachers. Many of the principles you are working with are indeed ones that we are trying to incorporate in a set of curated (not too many good ones yet are out there) and designed (just beginning) Apps by us. I have just finished three grant proposals to fund the design of all this, but we don't know if any of it will be funded. We are going to use this semester to forge ahead without real funds, but know that at some point, Richard and all, we should sit together to discuss the intersections in all this work. Regardless of the age range we will be working with (four or five to 12), they will all have no knowledge of English, technology, most early childhood concepts that we take for granted, and reading.

We have already deployed one tablet aimed only at language and concept development, with great donated resources from places like Scholastic for ebook libraries stored on their tablets. But it would be important for you to know what we come up with; for, it will be fueled by many of the same insights, including music's role in all of this. As Ani knows, my masters student has found some wonderful things out about the correspondence between precursors of reading like phoneme awareness and some important aspects of music development (rhythm perception and production).
So, just another not so surprising aspect to this fascinating journey we are all on, in our different ways.

Kindest regards,
Maryanne

You get the picture. Maryanne's book transformed my thinking on the "you gotta open the kid before you open the book" quote. Reading her book and meeting her opened me to another possibility:

Sometimes you gotta open the book before you open the kid.

Or maybe you open the tablet. Or the iPhone. Or the Samsung. But first, of course, you must find a way to teach children to recognize symbols and translate them to meaning.

The deer and panther prints in the snow, the McDonalds and Burger King logos, the Sumerian beer order scrawled in clay, the Dick and Jane reader, Proust and the Squid, and the code in the software of Candy Crush Saga all share a similar RICHness and sacred space in the human brain. To recognize, identify, comprehend and harness their meanings

is to read deeply. And to read deeply is to step onto a rocket ship to an entire universe of ideas, joy, suspense, possibilities and richness.

I have come to think that you can read a good book, but you can never read a great book. A great book reads you.

A great book starts a conversation that can lead to a richness you never knew existed. To people. To places. To ideas. To the adjacent possible that simply wasn't there until you cracked its cover. There is much covered in between book covers, but in order to dis+cover the richness of knowledge on the other side of those covers, you must first lead the child to believe that the treasures are there, and the treasures are theirs if they simply open the book, open their brains, and open their minds to the richness of reading.

The RICH Learning Dis+Covery

Today I delight in grabbing a book with an intriguing title and marking it to pieces. I enjoy engaging in a conversation with an author I've never met. Some living. Some dead but suddenly alive in me. I scratch questions, comments, thoughts, connections to other books and quotes of authors that come to mind. If the book really speaks to me or sings to me or brings to me a greater question, for some audacious and very selfish reason, I try to contact the author and continue the conversation in person.

I have discovered a delightful truth in the process: anyone today can hunt almost any author down, invite them to coffee or dinner or a California Malbec under Japanese lanterns and continue the richness of a living conversation. Turning the pages of a book into a living book beyond the pages, that's how I befriended all three of these brilliant neurologists – Maryanne Wolf, Ani Patel and John Ratey. Turning their books into conversations has led to a RICH Learning curriculum being developed and tested. Through the pages of their books, through the email trails that followed, through a number of dinners in Boston (one held with sirens wailing on the night of the Boston Marathon bombing) that is how I began to uncover and develop the RICH Learning concepts. Dr. Wolf's research suggests that lesdyxic children are reading on both sides of their brain. Her work will tell you how exactly many milliseconds it takes for light to enter the retina, pass to the optic nerve, and then bounce to the left brain for linguistic and sound processing. One "problem" in the dyslexic brain is that at the same time the information flashes to the left brain, it also flashes to the picture processing parts of the right brain. That shouts out to both sides SLOOOOWWW DOWN!

But is there anything wrong with processing letters as pictures? That is one of the problems in the dyslexic brain. That is also one of the "problems" in the Chinese, Japanese, Indonesian, Korean, and other Kanji-reading peoples of the world

THE RICH LEARNING CURRICULUM

who regularly beat most Western countries' scores on international tests and boast an unusual proportion of math, science and engineering grad students at top universities around the world. Is this a problem? Or is it a marvelous advantage?

Reading on both sides of the brain may be a portal to ingenuity, creativity and innovation. Harnessing the ability to read and think with both sides of the brain may bring us one notch closer to genius. If we can but help the problem reader slow down and learn to "read" with their whole brain, that problem reader may one day be able to help the rest of us speed up and see what only they can see, hear what only they can hear and think up solutions to problems before they even occur.

Thanks in part to Dr. Wolf's literacy work, Dr. John Ratey's research on exercise and the brain, and the music and language studies of Dr. Ani Patel, our team is currently designing and testing a curriculum that will help children at all levels of ability succeed and exceed early learning standards. It may also one day make strides in helping children with learning challenges like dyslexia and ADD/ADHD succeed in ways they and their parents never thought possible.

THE DESIGN - MUSIC:

First, since thinkers from Plato to Patel know and show music as the most potent attention and retention tool in our learning arsenal, we have built music into the core of our new curriculum.

We gathered 36 musicians to write 500+ early learning

songs. We designed the scope and sequence to include fifteen subject areas ranging from spelling, phonics, vocabulary and languages to math, science, health, and character development. We developed these resources for preschoolers first, and will eventually move to older grades once we know more about how to maximize the power of music to meet our educational goals.

THE DESIGN - MOTION: Second, since we knew the ADD/ADHD brain needed focus and that exercise promotes focus like no other tool, we have built movement into the core of everything we teach. We never teach ANYTHING new sitting in a chair. When new information is being taught—that is not the time to sit. The time to sit is after new information has been sung, danced, jumped, and pounded across billions of neurons throughout their brains and bodies, and into their conscious awareness and subconscious memory banks.

Only after embedding new information with this whole-mind approach (brain+body+environment) and only after a water break (exercise dehydrates lungs... water pumps oxygen back into the brain), only then will we allow anyone to sit. Only then will we take a break so the brain has a chance to recharge. And then, through intentional conversations about what we have just learned, we might just sit, rest, talk about what we learned and begin the process of moving new information from the brain's short term scratch pad (hippocampus) into the long-term hard drive (neo cortex). And when the break is done, we will jump up and do it all over again!

V :

"I cd'nuolt blveiee
that I cluod aulaclty
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I was rdanieg.
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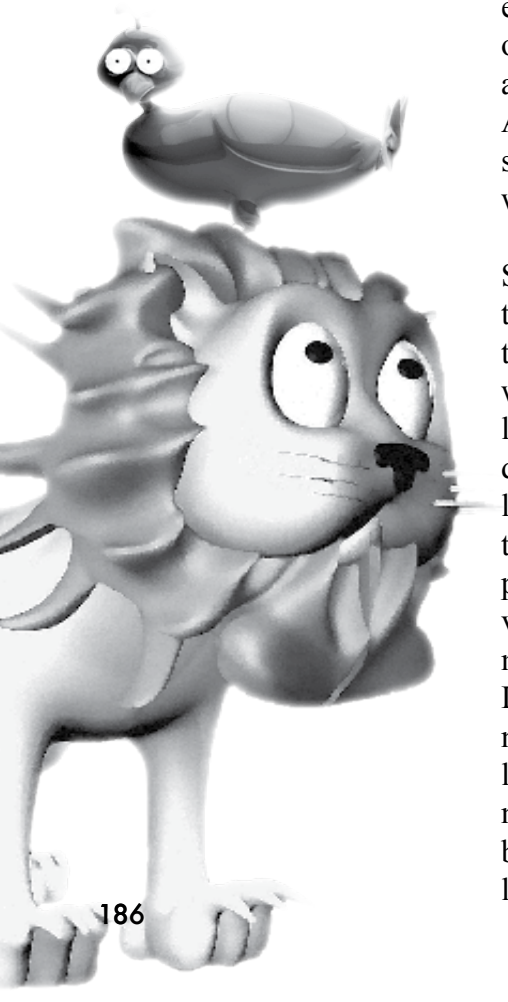


THE DESIGN - ART:
Third, since we know how much the brain loves visuals, we are including art in everything we teach. Children will sketch, draw, paint and create art on each lesson, adding the OPERA magic of art to their learning experience. As a key part of the art, we are building a zoo full of 30 colorful ABC animals to help teach spelling and phonics along with the letters and shapes.

Speaking of reading visuals, the dyslexic child often has trouble with letters inside a word – not the first and last letters of the word. We have designed our first spelling lessons to teach as many three-letter animal names as possible, along with sounds, visuals and the muscle skill memory of American Sign Language. The child only needs to "read" the first and last letters of our animal names and their brains and bodies fill in the rest. (Just like your reading brain

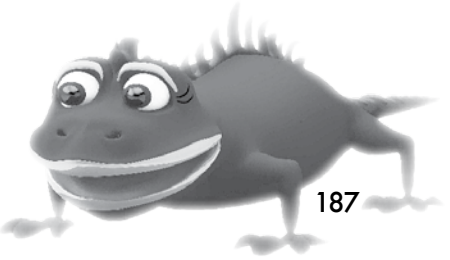
filled in the middle of the impossible sentences on page 35.) Our first early reading vocabulary list sings and signs and spells these ABC animals:

Week 1	**ANT**
Week 2	**BEE**
Week 3	**CAT**
Week 4	**DOG**
Week 5	**EMU**
Week 6	**FOX**
Week 7	**GNU**
Week 8	**HEN**
Week 9	**IGUANA**
Week 10	**JAY**
Week 11	**KOI**
Week 12	**LION**
Week 13	**MOLE**
Week 14	**NEWT**
Week 15	**OWL**
Week 16	**PIG**
Week 17	**QUAIL**
Week 18	**RAT**
Week 19	**SNAKE**
Week 20	**TOAD**
Week 21	**URCHIN**
Week 22	**VULTURE**
Week 23	**WALRUS**
Week 24	**X-RAY**
	TETRA
Week 25	**YAK**
Week 26	**ZEBRA**

Just for fun, we end the 30 spelling themes by teaching that sometimes two letters can make one sound, like CH, PH, SH, TH:

Week 27	**CHIMP**
Week 28	**PHEASANT**
Week 29	**SHEEP**
Week 30	**THRUSH**

By simply attaching our spelling to songs, cartoons, muscle skill memory (sign language), dance, art, friends and fun, we are bombarding brains – dyslexic, ADD/ADHD and all the rest – with all the neurochemicals they need to turn our learning into a won-won-wonderful, fun-fun-funderful, thun-thun-thunderful and effective attention and retention group experience. Does it work? Go online to www.



richlearning.com and watch a 3 1/2-year-old named Varshini teaching a 4 year-old how to spell Ant, Bee, Cat, and Dog. Next view a 3 1/2-year-old named Palak spelling Apple, Banana, Carrot, Date, Eggplant and Fig with her hands in English. Neither of these girls knew how to spell a single word in English seven weeks earlier.

ONLY A START

Maybe you are just at the beginning of your adventure with brain-based learning on arts-based platforms. Great. Get started! Make up your own songs, dances, theater and art. It's going to be a grand, surprising, fun adventure.

Maybe you have experimented with using music, motion and emotion in your teaching environment for a long, long time.

Great. Now you know the science behind why it works. I call it the "why behind the what." Now you can backwards-design even more effective approaches and reinforcing resources.

Within a short time of intentionally applying RICH Learning philosophy to teaching, you will begin to see encouraging and possibly amazing results. By using the whole body as a learning tool and connecting billions of neurons rarely used in the learning process, you will turn education into a curious and joyful challenge for all, rather than a frustrating and boring problem for many. You will craft cultures of exploration that surround children with love, care, engagement, creativity and fun. You will enter the world of the child and hold them. (Remember "en+ter+tain?") And yes, you will pump all the neurochemicals that come with joy, active learning and fun into their brains. Their bodies. Their environments.

Their minds.

As time passes, you will discover and master even more effective strategies that grab the attention of even the most over-stimulated, over-cluttered, text-a-second children.

Singing? Dancing? Theater? Art? Is this entertainment? Yes. It is entering their land and holding them.

Is this selling out? No. It is buying in to what we now know about teaching in the ways the human brain learns best.

By feeding oxygen, glucose and BDNF into brains and washing away the toxic stress hormone Cortisol, you will see even more magic. Those wacky, bouncing, semi-manic children on attention drugs may not need as much of their medication after a while. Even the most challenging. unfocused minds may find themselves accomplishing more in ten minutes of your active learning environment than they did sitting in a chair all day in their former classroom setting.

By enlisting the arts to open hearts, you will have opened the kids before you opened the books. You will have created an optimal context for the delivery of the basic content. And from there, creativity, confidence, curiosity, insight, inspiration and joy will follow.

And one day, as you master the application of RICH learning in young brains, you may feel called to apply what you know to the challenges of aging brains. My own father's experience with dementia calls me to do just that. Maybe you'd like to join me in this research?

Through it all, we will keep one truth in mind...

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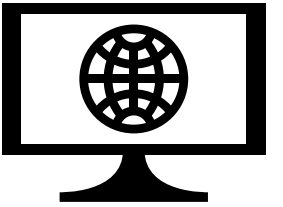


Before we can make any difference for the children around the world, we must first make a difference in the world around the the children.

– Dr. Rich Melheim

VI.

Conclusion:

Why Brain-based Learning on Arts-based Platforms at the Core of Early Education?

Former Secretary of State Henry Kissinger came to America at age 12. His brother was 10. Henry speaks with a very strong German accent. His brother has no accent.

One can learn a new song, a new dance, a dramatic role at any time in life, but before age 12 the brain is set up to learn these things a whole lot easier.

Prior to puberty, the brain is operating at a speed of about 1/250,000 of a second. At the onset of puberty, it slows down to 1/150,000 of a second. The child's brain is almost twice as efficient at grasping and holding language, math skills, science and social skills as it will be once their hormones kick in. Suffice it to say, you've got to start young. Neglecting to employ the BEST learning techniques as early as possible is simply lousy stewardship.

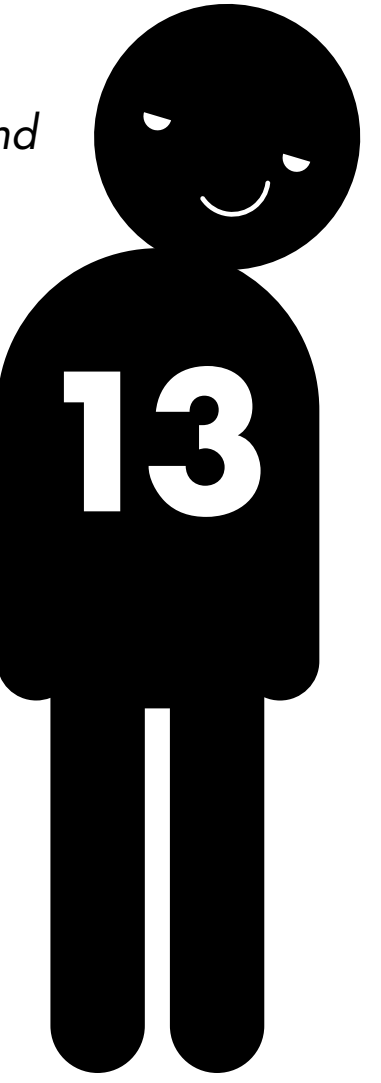
You must place the hockey protégé on ice and skates young or they won't stand a chance later on. Get a young child on stage, into music, and onto the canvas early enough, and you'll create a life-long learner who is also a life-long teacher.

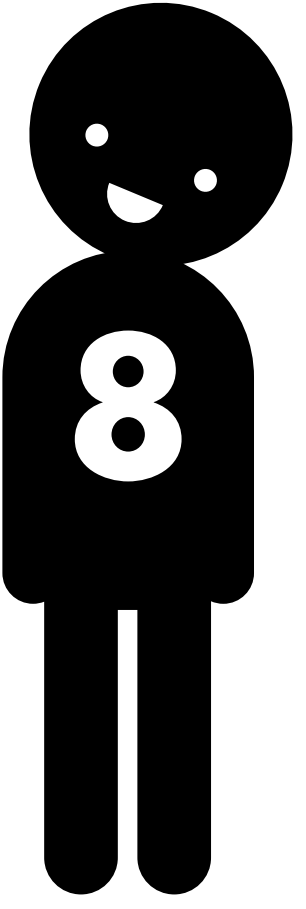
The earlier you learn to love learning and feel successful at it, the greater the chance you will crave it, seek it, revel in it, share it with your friends, and delight in it the rest of your life.

Like no other tools, Performance Arts lead children to love learning. Like no other tools, the Arts feed the developing brain exactly what it needs to grow, thrive, and crave more. Like no other tools, the Arts should be woven into the core of everything we try to teach if we truly desire to teach with the young mind in mind.

VI:

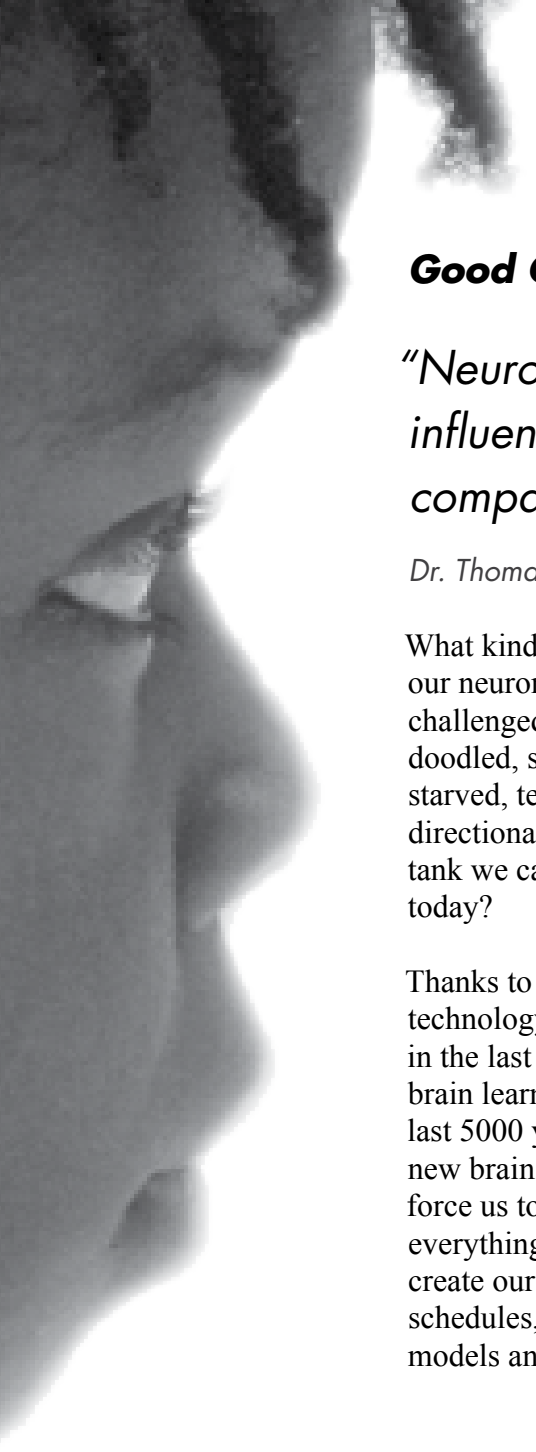
1/150,000 Second





1/250,000 Second

V



Good Company

"Neurons are greatly influenced by the company they keep."[37]

Dr. Thomas Czerner

What kind of company are most of our neurons keeping in this under-challenged, over-teched, mindlessly doodled, sit-still-in-a-desk, pattern-starved, teach-to-the-test, one-directional, pre-television era holding tank we call many of our schools today?

Thanks to advances in brain-scanning technology, we have learned more in the last five years about how the brain learns than we have in the last 5000 years. If we take this new brain science seriously, it will force us to rethink how we teach everything. How we design and create our lessons, learning spaces, schedules, movements, methods, models and materials. Everything.

VI:

Recap

On the molecular level, we have discovered that without at least two simultaneous Magnesium keys placed in the locks, an individual molecular learning gate won't open. Without the gate opening, individual nerve cells won't fire.

Without multiple nerve cells firing a massive sensory bombardment of information, the brain won't recognize patterns and register what we are trying to teach or recall as worthy of either attention or retention.

Talking to the ears only stimulates about 5% of the left brain. That maybe 5% of one half of the brain (2.5%), but if the "mind" is the brain meets the body meets the environment, it is only 2.5% of one third of the mind. Do the math. 5% divided by 2 divided by 3 is .833333% of the mind we're teaching when we lecture to the ears only. That's lousy stewardship!

There is so much more of the mind we can access easily and inexpensively by simply getting out

We're reaching a mere

.8333333333%

of the mind when we only teach the ears.

of our seats and adding movement, music, theater and the Arts to the brain, body and environment. The literal meaning of education – from the Latin educere – means to lead out or draw out. (e = out + duke = lead). Adding music, movement, theater and art automatically draws out and engages minds and hearts of young and old like nothing else.

If we are serious about embedding patterns into their brains that learners will be able to retrieve years later, why wouldn't we teach with more than the spoken word? Why wouldn't we sing the lessons and dance the lessons? Why wouldn't we act them and play them and draw them while employing eyes, ears, mouths, muscles, emotions, and the one sense is often forgotten in the classroom – the sense of humor?

Why wouldn't we access an array of billions of sensory input devices and connect them across the platforms of the entire mind?

If we want to optimize memory, why wouldn't we use every asset in our

VI:

En+ter+tain

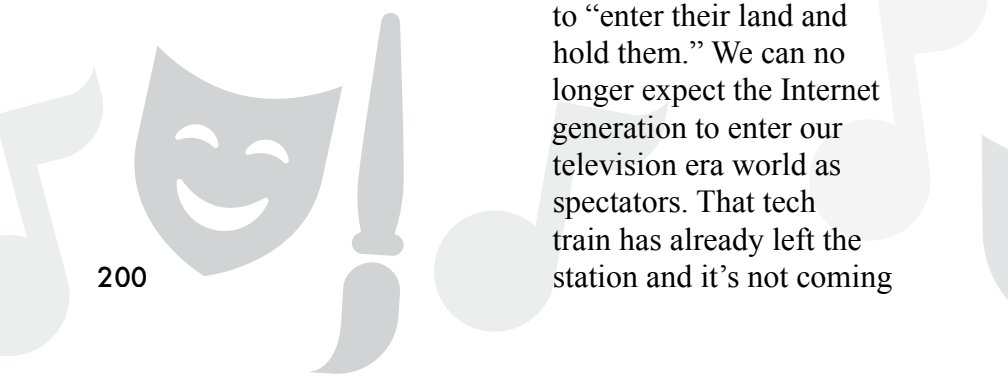
En *= in or into.*

Ter *= the land. (as in territory, terra, terrain, terrarium)*

Tain *= to hold (as in contain, retain, obtain, fountain)*

brain-based arsenals, and set those patterns in place at the optimal moments in a child's day, a child's night, a child's life? If we want to teach something young learners will be able to draw out the rest of their lives, why wouldn't we have them literally draw it out on paper now? Does all this sound a little too much like entertainment to be education?

Before answering that question, take a second look for a pattern in the word en-ter-tain. En-ter-tain literally means to "enter their land and hold them." We can no longer expect the Internet generation to enter our television era world as spectators. That tech train has already left the station and it's not coming

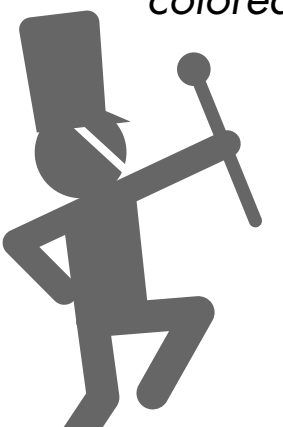


back. We must find ways to enter their land if we are to hold them.

We cannot expect them to be held captive by our oratory. The Post-Gutenberg/Neo-Googleberger generation will not simply sit passively watching our show. We can either sit around complaining about what's wrong with kids today, or we can realize that the student is not learning the way we are teaching and start searching for methods to teach the way the students are learning.

Neurologically, what do we know to be the best ways to "enter their land and hold them" today? The very best ways are no-brainers because they are whole brainers. No. They're no-brainers because they're whole-minders. The best ways to engage children of this brave new post-television world are to engage brains, bodies, environments and hearts with multi-dimensional OPERA Arts.

So sing it.
Dance it.
Sign it.
Draw it.
Act it.
Splash it across a large canvas with finger paints.
Trace it on the sidewalk with colored chalk.



VI:

Cut it out of magazines. Glue it together with junk drawer treasures. Make it out of Jell-O, feathers, walnuts, ice, SPAM sculptures. Touch the art. Smell the art. Taste the art. See the lesson. BE the lesson. See the art. Be the art.

Create a work of visual or dimensional art on the theme. Name it. Claim it. Then frame it and hang it on the wall in a weekly gallery hall. Applaud it. Toast it. Celebrate it in a weekly exhibition and photograph it and Facebook it before you let it out of your sight. Tell your teachers, friends, parents and strangers about it. Take it on the road to a nursing home, a veteran's hospital, a flea market, a sidewalk sale. Teach others about your art and ask them about theirs. Sing for them. Dance with them. Ask them to tell you a story in song. Build your songs and stories into a show and a collage. Post the video and art online for the world to see! Podcast your young artists' voices telling about their work. Call a famous artist, photographer or filmmaker on a speaker phone or Skype and ask them about their work. Then show them what you have done and invite a critique. Take the works home. Connect them with caring conversations on your themes seven nights this week at bedtime. Go deep, deep, deep into the "why" behind the "what" and draw out the pathos, humor, emotion, and truth behind the canvas.

Every way you interact with art becomes another

learning opportunity, another myriad of neural connections, and another road you take towards deeper meaning. Get onto the road of teaching, and the road gets into you. Create a culture where the students are teachers using performance arts. Create a system where the teachers are students of even the youngest artists. (Especially the youngest artists!) Make every lesson a work of art and every work of art a lesson. Do this and you will create curious curators and life-long lovers of learning from children who find it natural and necessary to create. To share. To teach. To celebrate their part in the marvelous art of life and love and learning. And one more thing...

Studio vs. School

Consider embracing the metaphor of a **studio** or a **theater** and expelling the metaphors of the **classroom** and **school**. Language matters. The metaphors we use matter. They mold us. Sometimes they hold us... together. Sometimes they hold us back. Metaphors like teaching, teachers, students, classrooms and processes matter.

We shape our metaphors, then our metaphors shape us.

Consider renaming, reframing and regaming the language for what you are trying to accomplish.

What might happen to learning, joy, creativity, and expectations if you ditched the words class and classroom and embraced the metaphor of the studio? How might it effect attitudes, emotional connections and test scores

if classrooms looked more like theaters, art galleries, and dance halls rather than straight-rowed, one-directional teaching spaces?

What would a studio look like compared to a classroom? What might a theater need? Mostly chairs for spectators? Mostly stages for performers? What might happen to the ebb and flow of your day if mornings were renamed Act 1? Lunch breaks became Intermission? Afternoons were thought of as Act 2? What happens to administrators, teachers and support staff if they are renamed directors, cast and crew? What other language might you want to change and incorporate to support the theater metaphor?

Uncommon Core

As for a Common Core, what our children need for the challenges of the 21st Century is an Uncommon Core. Consider creating an "Uncommon C.O.R.E." task force to reshape the metaphors and processes. Maybe call them the Uncommon...

Committee to
Organize the
Re-engineering of
Education

Their task will be to design the arts into the DNA of every learning experience. Every learning experience. Did I mention every learning experience? They will use the OPERA Hypothesis as the guiding principle to rethink, remodel, redesign and reshape everything taught with the Arts – music, movement, visual arts and theater – at the core.

Why?

VI:

Why?

Why?

Why?

Because

arts work.

Because the Arts teach the way the brain learns.

Because engaging in the Arts is considerably more attentive and retentive than listening to lectures.

Because the Arts flood the brain and body with chemicals that say, "I love this" and "I want more!"

Because the Arts create patterns crossing all portions of the brain. They reach beyond brain cells to connect with neurons throughout the body and out into the environment.

Because the Arts will turn the next generation into active participants, creators and directors of their own education rather than passive spectators waiting for the teacher to do something entertaining.

Because the Arts are filled with joy. Surprise. Creativity. Innovation. Fun. And these gifts can and will change the brain.

The child.
The parent.
The teacher.
The society and culture.

The world.

VI:

Okay.

Amen.

We're done here.

You are now officially certified as a RICH Learning Specialist. Go teach someone else. Quick.

Then have yourself some cheesecake.

As a newly minted fellow amateur educational neurologist, I have but one final word for you.

From this day forward and forevermore you are going to be seen as seriously and absolutely...


BRILL

!ANT.

*All because of the crazy – effective results you're going to get when you connect **Music** and **Motion** and **Emotion** and **Art** and **Theater** and **Fun** together as your secret technologies to enlist and engage the post-Gutenberg/neo-Google generation as creators, actors and directors in their own show.*

You goteth it?

Good.

Now abouteth that cheesecake...

The End.

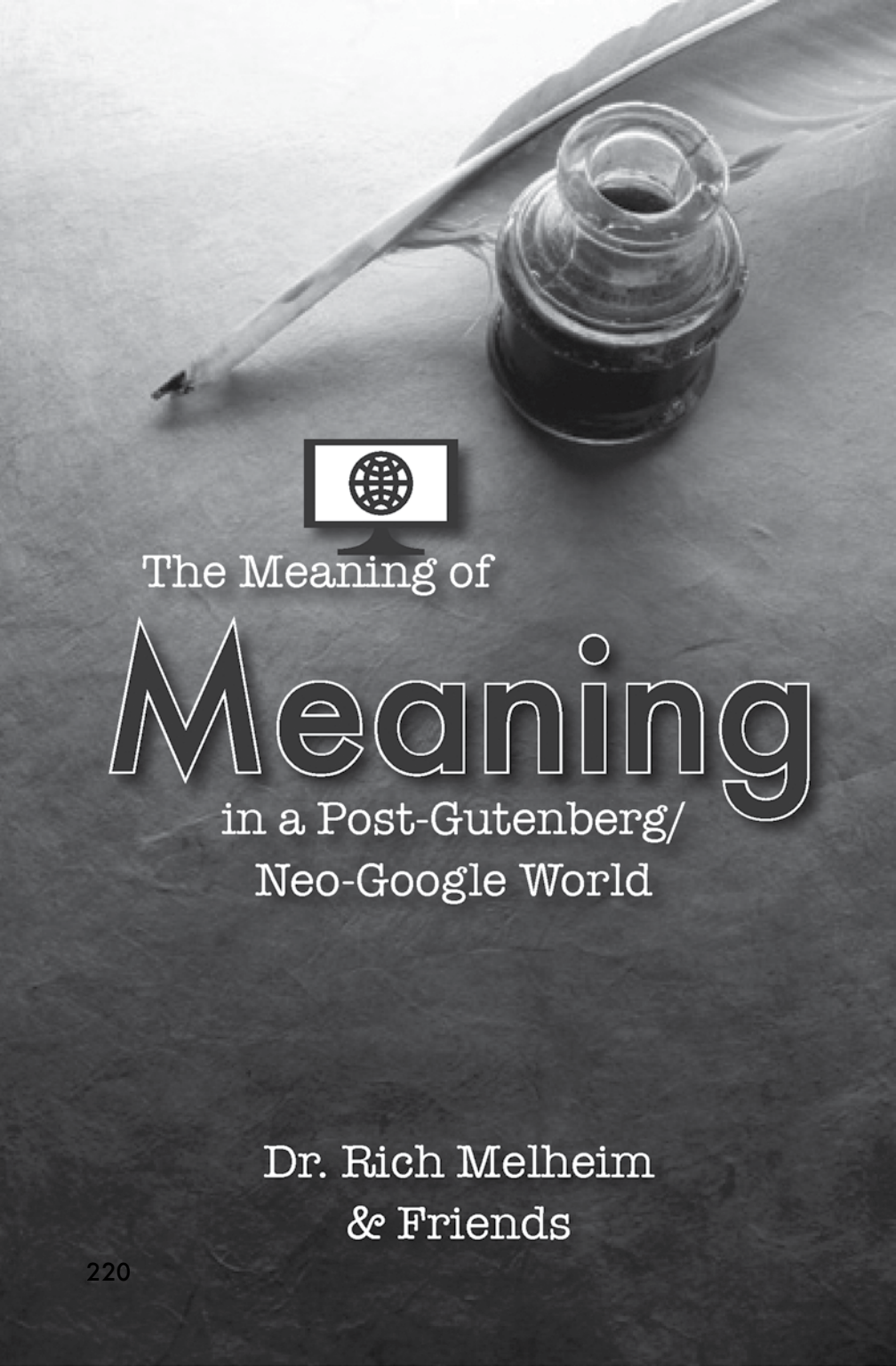
About the Author

睿启博士

Rich Melheim likes to think.
Rich Melheim likes to play.
Rich Melheim likes to act.
Rich Melheim likes to breathe deep and pray.

Rich Melheim likes to draw.
Rich Melheim likes to sing.
Rich Melheim likes to travel to strange places and eat most anything.

Rich Melheim likes to meet interesting people.
And he likes to hang around people who like to do that, too.


The Meaning of
Meaning
in a Post-Gutenberg/
Neo-Google World
Dr. Rich Melheim
& Friends
220

Grammy-winning musicians. Mothers dying of cancer. Oscar-winning film makers. New York Times Best-Selling Neurologists. Emmy-Winning Animators. Psychiatrists. Philosophers. Sociologists. And a bunch of people just like you.

What do they have in common? 75 of them spoke to a slightly dyslexic semiotician, amateur complexity theorist and designer of preschool systems on meaning-making in our a crazy-fast world.

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Educational Theory **$19.95 US**

You gotta open the kid before you open the book.

– Dr. Rich Melheim

After 33 1/3 years in education, publishing, parent training, inter-national speaking, cartooning, and a little stand-up comedy, the amateur neurologist and slightly dyslexic entrepreneur, Dr. Rich Melheim, started learning Mandarin, earned a doctorate in semiotics, gathered a team from Harvard to Hollywood and immediately became a preschool teacher...

...in India, Ethiopia, Minnesota and South Carolina.

He wanted to discover how little brains and aging brains learn best. And what did he learn about learning on his quest? Well, for starters...

- To learn anything new, one must first open a child's mind, heart and attitudes.
- Neurologically, nothing opens minds and hearts and attitudes better than the Arts!
- The most valuable tools parents and teachers have in their educational arsenals are absolutely free: Music. Dance. Theater. Art. Stories. Fun. Giggles. Wiggles. Mystery.
- Once you have opened minds and hearts while embedding new information with the Arts, the next steps are to **R**ecognize, **I**dentify, **C**omprehend, and **H**arness the information (RICH... get it?) Put what you just learned to work. Fast! The new information can now move from short-term to long-term memory centers of the brain and hardwire itself into usable knowledge.
- The results? Attention. Retention. Curiosity. Creativity. Connections. Innovation. Insight. And a life-long love of learning.

In a couple hours of witty and easy reading, this insatiably curious student of the human mind will take you on a fascinating journey through the neurology of optimal learning. Then he'll explain why you need to throw out all the chairs and desks in your classroom. In the end, Melheim will leave you on the doorstep of becoming a richer and more engaging world-class parent or teacher for the rest of your life. Oh. One more thing:

It doesn't cost a nickel for a million-dollar smile.

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