Welcome
Neuroscience & the 21st Century Learner

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The Brain’s Three Questions

Who are these people?

Why are we here?

Where are we going?
Agenda

Welcome

Meet Your Brain

Applications for Educators

Closing
Learning Outcomes

• Build an understanding of how people learn.

• Build an understanding how understanding can be used to create brain compatible classrooms.
Holland, Michigan
My Credentials

Educator for 41 Years

Preschool-Higher Ed.
Linda’s Family
Getting Your Brain Ready to Learn

Greeting at door
Positive, Welcoming
The Research on Greeting

Did you know?
When teachers greeted students at the door, on-task behavior during the first ten minutes of class increased from 45% to 75%.

*Journal of Applied Behavior*
Getting Your Brain Ready to Learn

Agenda with Visuals

Agenda

- Welcome
  - Introductions & Relationship Building

- The Why: Why Change

- The Who: Neuroscience: How Our Students Learn

- The How: Instructional Strategies for Relationships

- Closing Questions & Evaluations
Research indicates that visual cues help us to better retrieve and remember information.

Haig Kouyoumdjian Ph.D.
Neuroscience and Visuals

• Images get stored as long-term memory
• Visuals are processed 60,000 times faster than text
• Emotions and visual information are processed by the same part of the brain
Getting Your Brain Ready to Learn

Targets/Outcomes for Learning
Research states that clear communication to students about the goals of their studies and expectations for their assessments sets a pattern that gives them the security that accompanies predictability. This gives students more self-confidence and less anxiety.

-Judy Willis, M.D.
Relationship Building

Form groups of 3-5 people

Introduce yourself to each other

Create a list of 3-5 things you have in common.
The Biology of NOT Belonging

Perceived Threat Response
Amygdala hijack—Fight, flight, freeze
“Social pain activates the same region of the brain that signals physical pain.”
It’s ALL About Relationships

• Know them beyond their academic profile
• Invite kids to have lunch with you
• Attend their extracurricular activities/events
• Make home visits when appropriate
• 2 X 10 method
Kids don't learn from people they don't like.

-Rita Pierson, TedTalk
"No significant learning happens without a significant relationship." – James Comer
A Changing Landscape
Our Students Have Changed
surviving the technological alteration of the modern mind

iBrain
Gary Small, M.D., and Gigi Vorgan

UNDERSTANDING THE iGENERATION AND THE WAY THEY LEARN

Rewired
Larry D. Rosen, Ph.D.
Brain Geography...
Do you Own a Million-Dollar Racehorse?

If you did, would you…

- Keep him up until the wee hours of the morning?
- Permit him to skip 90% of his training rituals?
- Let him maintain a poor non-nutritious diet? (pop and potato chips)
- Endorse an almost completely sedentary lifestyle?
- Find it okay for him to play video games for 3-4 hours a day?
- Experiment on him with habit-forming and destructive drugs and/or hallucinogens? Sometimes combining them with alcohol?
- Let him “hang out” with other unambitious horses listening to music for most of the day?
Do you Own a Million-Dollar Racehorse?

If you did, would you…

• allow him to watch 1,400 hours of TV each year, complete with 18,000 gratuitous horse murders and expect him to be well-adjusted with a healthy self concept, and to see the world as a supportive, friendly place to grow, develop and a place where he will maximize his full potential?
Do you Own a Million-Dollar Racehorse?

If you did, what would he be worth to you or himself?

Our students and children have multi-billion dollar brains. We should not allow their brains to be treated in ways far worse than we would ever treat a horse.

Kenneth Wesson
The Brain

SO WHY DOES INFORMATION FROM THE NEUROSCIENCES MATTER?

IT HAS BEEN A CURIOSITY FOR MUCH OF HUMAN HISTORY!

• First anatomical drawing of the human brain.

• Leonardo believed that all sensations—especially the emanations of vision converged at the intersection of lines.
Michelangelo – 1511 a.d.
Creation of Adam – the brain of God?
Early Brain Studies....
Phrenology
Yesterday’s thinking…..
Phrenology – 1840s and 50s

An early practice at the end of the 19th century that claimed to be able to identify mental capacity and character by feeling the bumps of the skull.
Early studies....
Neuromyths in Education

• Some of us are Right Brain and/or Left Brain
• Listening to Mozart makes your baby smarter
• After critical periods of development, learning shuts down
• We only use 10% of our brains
• We need to assess and teach to each child’s learning style
• We are born with all the brain cells we will ever have
Today’s Science…
SPECT Scans
PET Scans
MRI and fMRI
It is possible to see the mind at work!
How Do People Learn?
“LEARNING IS THE BRAIN’S PRIMARY FUNCTION…”

Frank Smith, Insult to Intelligence
Lobes of the Brain

- Parietal Lobe
- Frontal Lobe
- Occipital Lobe
- Temporal Lobe
- Cerebellum
Occipital Lobe

Processes visual data coming in from the outside world. Visual info is compared to previously stored associations to make meaning.
Parietal Lobe

Front section sends and receives info about movement.

Back section analyzes and integrates info for spatial awareness.
Temporal Lobes

This area is believed to be responsible for hearing, senses, language, learning and memory storage—especially auditory memory.
Frontal Lobes

Controls voluntary movement, verbal expression, problem solving, willpower, and mood.

This is how we are consciously aware of our thoughts and actions.
Communication of Neurons

- **Sending Nerve Cell**
- **Receiving Nerve Cell**
- **Axon**
- **Dendrite**
- **Spine**
- **Electrical Input**
- **Bouton**
- **Transmitter**
- **Electrical Output**
Photograph of NEURONS
Environmental Factors Affecting the Growing Brain

- Rapidly changing input-MTV
- Variation in family pattern
- Diet, nutrition, and drugs
- Less physical activity, more TV
- Greater stress, threat, and violence
- Emotion laden messages

—David Sousa, 1998
Cerebral Cortex

- Made up of 6 layers of cells, their dendrites and some axons and has four lobes.
- Different lobes have separate functions.
Limbic System
Brain Stem
Amygdala

- The psychological sentinel of the brain because it plays a major role in the control of emotion.

- It is connected to many parts of the brain and plays a critical part in learning, cognition and emotional memories.
Amygdala-Almond
Hippocampus

It helps us remember events in recent past, as well as responsible for sending new information and experiences to be stored in the cortex in long-term memory.

Critical to learning and memory formation.
Hippocampus-
FEED THE HIPPO!
Corpus Callosum

- 200 million nerve fibers connecting the right and left hemispheres, and providing instantaneous communication.

- Not fully mature until adolescence – ages 16 to about 25.
Corpus Callosum
Dirt Road to Super Highway
Reticular Activating System

- The RAS receives information from all over the body and acts as a central, initial regulator for attention, arousal, sleep-wakefulness and consciousness.

- It filters out distractions or trivial sensory information.
Reticular Activating System
The Filter...The Senses
The insulae are believed to be involved in consciousness and play a role in diverse functions usually linked to emotion or the regulation of the body's homeostasis. These functions include compassion and empathy, perception, motor control, self-awareness, cognitive functioning, and interpersonal experience.
Insula
All Learning is Emotional

An expert at USC’s Brain and Creativity Institute, Mary Helen Immordino-Yang, has found that emotional responses precede conscious understanding and are essential for memory and application of learning (Immordino-Yang 2016).
3 Key Findings About Emotions

Positive emotions can be elicited during learning in order to increase motivation.

- create personal interest in a topic
- instill confidence to meet the objectives
- eliminating comparison between learners
- make connections to real life

Darling-Hammond 2003
3 Key Findings About Emotions

2. Positive emotions lead to higher achievement.

- When compared to IQ and technical skills, emotional intelligence makes up nearly 90% of what distinguishes us from others and leads to growth.
- Using and developing Growth Mindsets.
- Educators are engaged.

Wilcox 2015
3 Key Findings About Emotions

Reframing our failures reveals opportunities to improve

- Using and developing Growth Mindsets
- Making Failure OK, (like video games, 80% failure rate)

Dailey-Hebert 2015
Strategies for the Structures

What lessons have you seen taught that activated these structures in students' brains?

Amygdala-Emotion
Hippocampus-Memory
Corpus Callosum-Movement
RAS-Attention
Insula-Emotion
Applications for Educators
Patterns and Programs
“Cayard forced America to the left, filling its sails with ‘dirty air,’ then tacked into a right-hand shift….That proved to be the wrong side. America, flying its carbon fiber/liquid crystal main and headsails, found more pressure on the left. Cayard did not initiate a tacking duel until Il Moro got headed nearly a mile down the leg….Cayard did not initiate a jibing duel to improve his position heading downwind and instead opted for a more straight-line approach to the finish.”

—USA Today, May 13, 1992
Learning Is A Two-Step Process

Making meaning through pattern seeking

Developing a mental program for using what we understand and wiring it into long-term memory

Hart, 1998
The Good News

Resiliency

Brains Can Change
What is Brain Plasticity?

Basically means the brain changes throughout life

- brain alters (it physically and chemically changes) in response to what it experiences
- thinking, learning, acting change the brain’s functioning and its structure
- We used to think the brain matured in adolescence and that was the end of growth (not so); changes are lifelong
Resilience

The ability to successfully cope with change or misfortune.

Life is not about how fast you run or how high you climb but how well you bounce.

~Vivian Komori

http://www.resiliencescale.com/faqs.html
Brain Compatible Classroom

Absence of Threat/
Mastery/Application
Nurturing Reflecting
Thinking

Sensory Rich
Environment

Adequate Time

Movement

Immediate Feedback

Meaningful Content

Choice

Collaboration

BodyBrain Compatible Elements

-The Center for the Future of Public Education 2016
-S. Kovalik
Brain Information

• Neurons that fire together wire together.
• The brain that does the work grows the dendrites!
• No meaning, no memory.
• Take your current lessons and frame them into the following:
  • Invite everyone to participate
  • Cause learners to think, process, work
  • Create multiple connections
KEY
KNOWLEDGE
EMPOWERS
YOU
Thank You!

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Neuroscience Books
Neuroscience Books

- The Hungry Mind
- Creating Innovators
- Unleashing the Potential of the Teenage Brain
- You Have a Brain
- The Primal Teen
- We're Born to Learn
- The End of the Rainbow
- The Owner's Manual for Driving Your Adolescent Brain
- Wired to Create
Neuroscience Books
Neuroscience Books