LAUSD Symposium on Gifted Education
December 15, 2018

Teaching and Learning in the Era of the Brain

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Understanding the Brain

Lessons From Neuroscience, Cognitive Science, Education, Psychology, Communication, Behavioral Economics, Other Fields, and Experience
Translated Into Classroom Practice

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Presented by
David Ghoogasian

Educational Consultant/Trainer
School Improvement Facilitator
The Lyceum

E-Mail: Ghoogasian@1Lyceum.com
Phone: (562) 686-1242

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Big Idea #1

The Brain Makes Connections

Question:

What Could or Should We Do Prior to Formally Beginning to Teach a Lesson?

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Big Idea #2

Emotion Plays an Important Role in Attention/Learning/Memory

Implications?

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Big Idea #3

The Brain Is An Active Organ

Implications?

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Big Idea #4

Each of the Sensory Pathways Is Different

Implications?

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Hemispheres of the Brain

The Brain has Two Hemispheres:

- Left
- Right

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Lobes of the Brain

The Brain has Four Lobes:

- Occipital
- Temporal
- Parietal
- Frontal

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Some Ways to Look at a Living/Working Brain

- EEG
- PET
- fMRI
- MRI
- SPECT
- MEG
- Other

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Big Idea #5

More Basic or Primitive Structures and Functions are Generally Associated with Areas Located Deeper in the Brain…

…but that's not the whole picture

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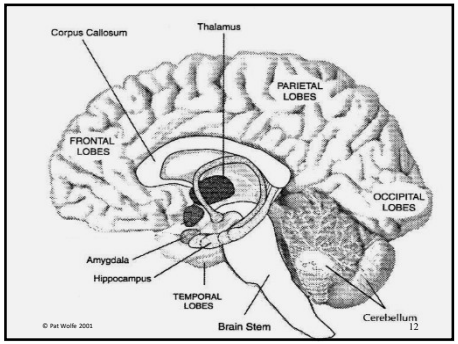

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What Are Brains Made of?

Two types of cells:

- Neurons
- Glial Cells

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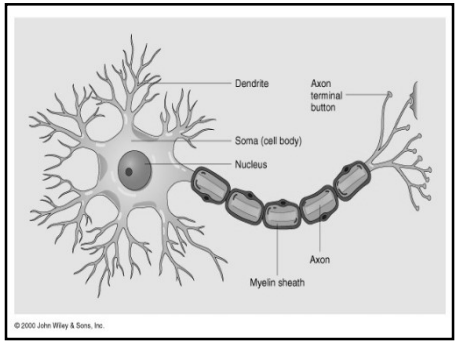

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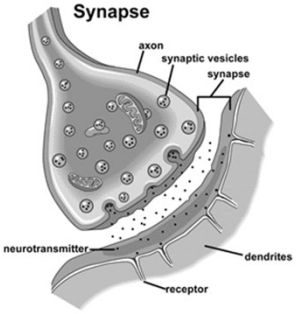

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Neurons Communicate Through an Electrochemical Process

- When a neuron is stimulated, an electrical impulse goes from the cell body, or soma, down the axon, to the ends of the axon terminal (synaptic knob, synaptic foot, terminal button/bouton)
- Neurotransmitters are released into the synapse (synaptic cleft) between the axon terminal of the pre-synaptic cell and attach to receptors on the dendrites, cell body, or axon of the post-synaptic cell
- The action within the cell is electrical and between the cells, it's chemical

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Information on the Brain

- An adult brain weighs approximately 3 lbs.
- We are born with about 100 billion neurons (?)
- At birth the brain weighs about one pound; by the end of a year, about two pounds; by about four years old, the brain is roughly 90% of its adult weight
- Some estimate that there are approximately 1,000,000,000,000,000 (1.0×10^{15}) connections among neurons in the adult human brain

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Learning

- When we learn, we are forging and strengthening connections among neurons in the form of neural circuits/networks

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Memory

- When we remember, neurons are being reactivated in the same patterns, reconstructing our memory of the experience

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Attention

- We cannot consciously attend to all the information that bombards the brain through the senses
- The brain drops much/most of this information before it enters our consciousness

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Attention

- Is it true that we can consciously attend to/focus on only one train of thought at a time?
- What about multitasking?

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Some Factors That Influence Attention

- Novelty
- Stimulus Intensity
- Cognitive Dissonance
- Meaning
- Emotion/Stress/Level of Concern

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Meaning

- The brain categorizes and tries to make sense out of its world
- When something new enters it, the brain tries to connect it or fit it into something that's already there (existing memory category/network of neurons)

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Meaning, continued

- What does "meaningless" mean?

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Emotion/Stress/Level of Concern

- A certain amount should be present for optimal learning to occur, but…

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Emotion/Stress/Level of Concern
continued

- Is there a "right" amount?

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Bringing It All Together…

How Might We Use This Information to Help Facilitate and Improve Learning?

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Some Approaches That May Help Us Learn Better, continued

- AB Teams/Reciprocal Teaching
- Brainstorming
- Differentiation
- KWL
- Metaphor/Analogy/Simile
- Mnemonics/Games
- Multiple Intelligences
- Projects
- Randomization/Equity Sticks

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Some Approaches That May Help Us to Learn Better

- Reflection
- Rhythm, Rhyme, Music, and Rap
- Simulations/Role Play
- Teaching in Layers, Not Lumps
- Telling Stories
- Visuals/Graphic Organizers
- Voting
- Whip Around – Pass Option

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A few words on the Gifted Brain…

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Notes/Reflections/Next Steps

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