

Following on the work that I did as a Public Fellow at the University of North Carolina-Chapel Hill with Dr. Wally Hannum of the UNC School of Education, this workshop is an examination of our developing understanding of the brain and how that dovetails with techniques performers, storytellers, and shaman have used for millennia to capture, focus, hold, and direct the attention of groups of people.

Knowing what the brain likes – what calls it out of a resting-inner state to alertness – can help guide the choices teachers and performers make in the order and manner in which new material is presented and later reinforced.

Understanding how the brain works, its evolutionary likes and dislikes, and knowing something of its neural development as we approach adulthood, brings us dramatic choices of how to proceed as learners, co-learners, and teachers. Strengths in one area, deficits in another, are normal for all learners. Awakening the brain to a state of engagement in the course of teaching is a significant aid in establishing relative balance between areas of strength and deficit. The plasticity of the brain throughout life runs in our favor; its revolving delight in newness favors continual learning.

We will examine the intersection of brand new information about the brain's workings and the very ancient aspects of its evolution, human ritual, and storytelling with an eye to giving teachers and learners concrete and new perspectives on their work.

The brain:

- is literally sculpted by experience.
- creates an internal neural model or map of the world.
- rests when the external world conforms to its predictive pattern of the world.
- awakens when it does not.
- craves newness and seeks divergence from an established pattern.
- strengthens neuronal connections (enlarging synaptic buds and physically changing the structure of the brain according to how often the new neuronal network is stimulated).
- with rehearsal and practice, moves skills, memories, and knowledge from the upper cerebral cortex downward in the brain to become set neuronal patterns of movement or thought/response that do not require higher brain activity, freeing the higher brain for incoming stimuli and new learning.
- more easily stores, recalls, and remembers stimuli that are marked with emotion.

- rehearses new neuronal networks when at rest, in sleep, and ‘daydreams.’
- reaches its highest number of neurons around age 10 or 11, after which it prunes the unused neuronal networks to arrive at the adult brain.
- myelizes (insulates) discrete neural connections to link different areas of the brain into a constellational and physical memory of our experience.
- has frontal lobes (inhibition, fine self-reflection, anticipation and awareness of others, rational discrimination, fine judgment) which only become fully myelized in one’s early to mid-twenties. (From all parents of teens: ‘Duh.’)
- evolved to have a distinct ability to hold abstract (non-present) thoughts and concepts, to recognize and build on experience and ideas in relation to one and other, and to reflect on these. The brain thrives in relationship and creates relationships. It is bizarre to try to conceive of an ‘I’ without an ‘us.’
- produces a great profusion of neuronal schema, trial connections, sketches or models of the world in a great and ongoing conversation with itself which is then moderated by stimuli from the world outside conveyed by the senses.
- holds for a brief period a latent physical trace of our immediate experience which can be reinforced and amplified to a greater or lesser degree of completeness and ‘long term potentiation’ by similar incoming sensory (or imaginary) data.
- correlates, updates or discards incoming experience by comparing it to past experiential traces the brain assembles and edits a verifiable pattern or model of the world: knowledge is not merely a product of immediate input, but involves the active construction of neural networks and cross comparisons by the brain.
- stimulates or ignores specific pathways and neuronal networks according to what it judges to be relevant experience. Reinforced networks strengthen and survive, unstimulated networks atrophy and the synapse literally melt away, dying in an almost Darwinian process of selection. Neural networks are selected, reinforced, or eliminated by our experience.
- least useful neuronal networks fade away as the brain recycles its resources in favor of the most useful networks in ‘survival of the useful.’
- uses newly discovered ‘mirror neurons’ to learn by witnessing, not just by doing. This holds for physical skills, but also for emotional states: grief, joy, happiness, pain. We are wired to feel compassion. It is something that has to be assiduously driven out of us by persistent conditioning to split the brain: boot camp experience.
- has two distinct hemispheres connected by the corpus callosum: we are all of two minds all the time. The Left Brain collects data, the Right Brain makes a coherent story that accounts for the data, even if data is fragmentary or incomplete.

What does this mean to us as teachers and learners?

Emotion, novelty (unpredictability), and approaching new information from a variety of angles, develops a web of neural connections and a *lowered threshold of stimulation for that neural network*.

What techniques do we use to communicate, elicit and trigger emotion with our voices, speech, bodies, hands and gestures as we present information?

Reinforcing existing experience while it is fresh and creating 'long term potentiation' is good.

On Long Term Potentiation [LPT]: the threshold of stimulation is lowered for a certain finite period of time when a neuron fires. The brain is vulnerable to reinforcement of that neuron. This one of the mechanisms by which we differentiate between random, meaningless experience and meaningful, useful neural connections. We are looking for useful skills and knowledge, which is relational. We are, at core, relating and related beings. We learn what we love.

And the brain is remarkably plastic, often building new neural networks to replace ones that are damaged, rerouting pathways to past experience, lost skills, etc. after strokes or brain damage. Its plasticity is in service to us as we adapt to new information, new experiences, and new limitations.

Share teaching problems, lesson plans, solicit brainstorming in the context of this new information. Suggested readings:

Mapping The Mind, Rita Carter

A User's Guide To The Brain: Perception, Attention, and the Four Theaters of the Brain
John J. Ratey

This is Your Brain on Music: The Science of a Human Obsession
Daniel J. Levitin, Plume Book/Penguin.

The World in Six Songs: How the Musical Brain Created Human Nature, Daniel J. Levitin

Mirrors in the Brain: How Our Minds Share Actions & Emotions
Giacomo Rizzolatti & Corrado Sinigaglia (Oxford University Press)

A Universal Consciousness: How Matter Becomes Imagination
Gerald Edelman & Giulio Tononi, Basic Books

Dawn of Art: The Chauvet Cave: The Oldest Known Paintings in the World
Jean-Marie Chauvet, Eliette Brunel Deschamps, & Christian Hillaire