

# Neuroscience of Learning and Application for Use with Low-income Populations

*Brian Stewart, RN*

## I. Learning Theory

- a. Almost all theories incorporate neuroscience; however, not all have been applied.
  - i. Examples: Transformational Learning, Problem Based Learning, Design Based, Team Based Learning, Constructivism
- b. Some may have elements of inconsistency with contemporary science
  - i. Example: Cognitivism, Behaviorism, Humanism
- c. The objective of using neuroscience is to provide another data element to explain the holes in the theories
  - i. People do not have to be neuroscientist to understand how they science applies to working with various populations.
  - ii. The research can create the Ah-ha “that is why my client is progressing or not progressing”. The objective is to move support from a deficit model to an empowerment model.

## II. Neuroscience

- a. Executive Function
  - i. Peak Periods: Child, Adolescent, Adult
  - ii. Resource allocation: allocations mental focus (attention), effort (problem-solving), and information distribution (adaptation)
  - iii. Frontal lobe in particular the pre-frontal cortex
  - iv. Develop and reinforcement to memory is linked to beliefs, social context, and values
  - v. Social element of adaptation in particular is linked to executive function
- b. Memory
  - i. Types: Sensory, Short-term, Long-term (variations)
    - 1. Implicit (unconscious) – Procedural (tasks)
    - 2. Explicit (conscious) – Declarative (facts: episodic or experiential)
    - 3. Memory Integration: Habit – Procedural memory reinforced with declarative memory
  - ii. Working memory utilizes short and long-term interface
  - iii. Optimal learning comes from engaging all levels of memory
    - 1. Repetition, Reflection, Reinforcement, Realization, and Rubrics
- c. Motivation/Grit
  - i. Acquired and Developed Behaviors
  - ii. Part of executive function, part of memory, and part of the limbic and endocrine systems

# Neuroscience of Learning and Application for Use with Low-income Populations

*Brian Stewart, RN*

- iii. Labeling (give meaning), reappraisal (see differently), mindfulness (consciously aware), coherence (balancing physical and mental state), drive (intentional focus)

## **III. Application Techniques**

- a. Application Techniques can be used in teaching, coaching/mentoring, program development, resource determination, and similar areas.
- b. Primary Mediation/Instructional
  - i. Reflection (Executive Function, Memory, Grit, Integration, Behavior)
    - 1. Provide alternative context. Ask students to reinterpret information based on the new context
    - 2. Provide relationship diagrams, impact, and assumptions
    - 3. Layer learning lessons and show the relationships between layers, other courses, and application of knowledge
  - ii. Validation (Grit, Behavior)
    - 1. Create a safe outlet for the students
    - 2. Non-graded, non-judging, a place to think freely
  - iii. Use Team-based Learning Activities requiring communication, collaboration and research (Executive Function, Memory, Grit, Integration, Behavior)
  - iv. Memory recall (Memory, Integration)
    - 1. Exams, Quizzes (Oral and Written)
    - 2. Games
    - 3. Role-play: “convince me why”, “tell me everything you know”, “tell me but without certain words/phrases/data”
  - v. Abstraction
    - 1. Personal reflection
    - 2. Exams and Assessment
    - 3. Elements with no obvious pattern
- c. Program Design/Resources
  - i. Problem Solving (Executive Function, Memory, Some Integration)
  - ii. Role-model and use evidence (Memory, Integration, Behavior)
    - 1. Social Impact Analysis
    - 2. Experience consequence
    - 3. Critical Events
  - iii. Answer/Provide the Why (Executive Function, Integration)
  - iv. Habit reinforcement (Memory, Integration, Behavior)
    - 1. Adapt to sudden changes and social constraints/context

# Neuroscience of Learning and Application for Use with Low-income Populations

*Brian Stewart, RN*

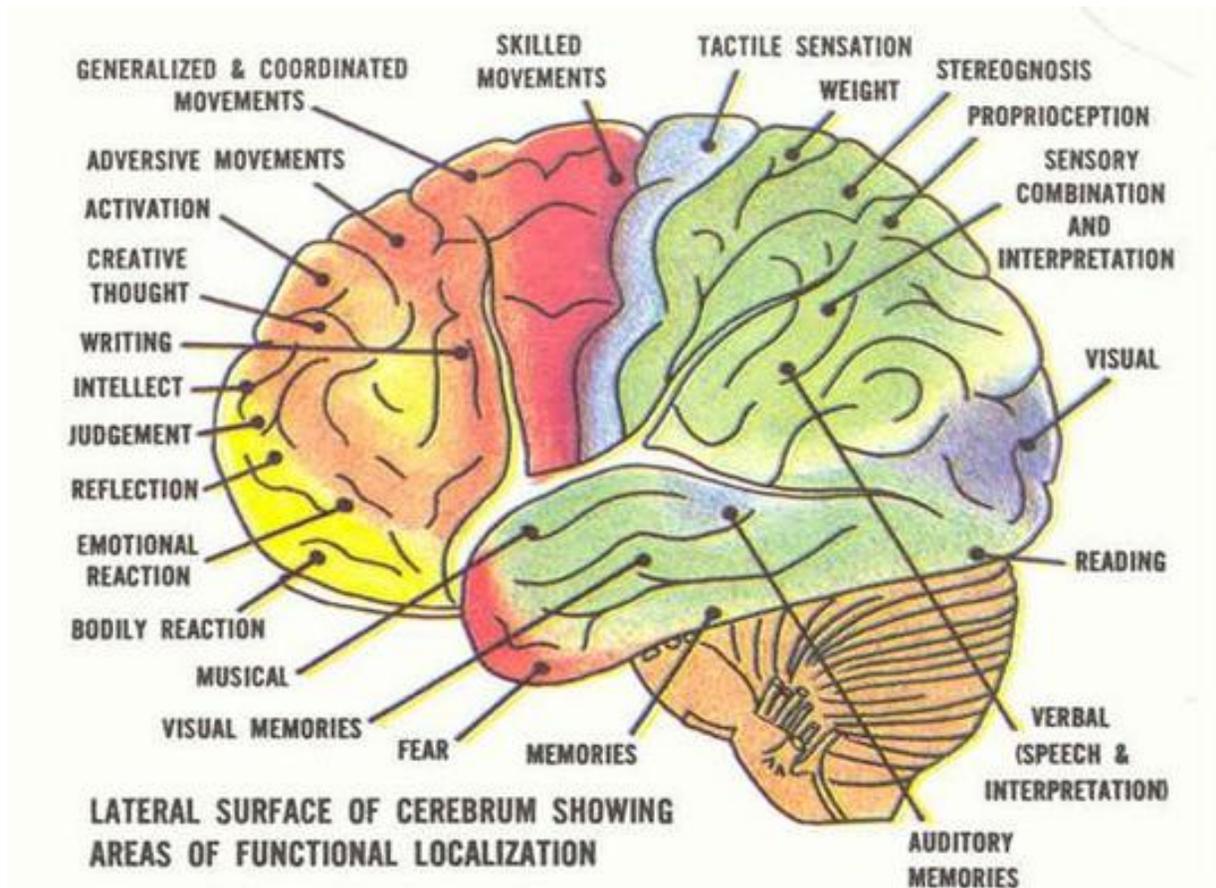
2. Repetition, Reflection, Reinforcement, Realization, and Rubrics
- v. Social comparative with personal reflection
  1. Cost-benefit
  2. Critical Event

## IV. References

- Anderson, P.J., Anderson, V., & Jacobs, R. (2010). Executive Functions and the Frontal Lobe: A Lifespan Perspective. New York, NY: Psychology Press.
- Andrews, L., Armstrong, E.G., Aschenbrenner, C., Friedlander, M.J., Kass, J.S., Ogden, P., Schwartzstein, R., Viggiano, T.R. (2011). What can medical education learn from the neurobiology of learning? *Academic Medicine*, 86(4). 415-420
- Kligyte, G. (2011). Transformation narratives in academic practice. *International Journal for Academic Development*, 16(3), 201-213
- Meltzer, L. (2007) Executive Function in Education: From Theory to Practice. New York, NY: Guilford Publications.
- Mezirow, J. (2000). Learning as Transformation: Critical Perspectives on a Theory in Progress. San Francisco: Jossey Bass
- Stix, G. (2011) The neuroscience of True Grit. *Scientific American*, 304, 28-33.
- Swanson, K.W. (2010). Constructing a learning partnership in transformative teacher development. *Reflective Practice*, 11(2), 259-269
- Taylor, E. W., & Cranton, P. (2013). *The Handbook of Transformative Learning*. San Francisco, CA: Jossey-Bass, A Wiley Imprint.
- Willis, J. (2010) Rubrics as a doorway to achievable challenge. *New Horizons for Learning Journal* Fall 2010, Vol 8 (2).  
<http://education.jhu.edu/PD/newhorizons/Journals/Fall2010/>
- <http://transformativelearningtheory.com/index.html>
- <http://www.human-memory.net/index.html>

# Neuroscience of Learning and Application for Use with Low-income Populations

Brian Stewart, RN



Cross-section of Human Brain with Functional Descriptions