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Article Critique #1

September 2, 2006

Zull, J. E. (2006). Key aspects of how the brain learns. *New Directions for Adult and Continuing Education: The Neuroscience of Adult Learning*, (110), 3-9.

### **Article Critique of “Key aspects of how the brain learns”**

#### **Summary**

The nine articles that comprise the August 2006 issue of *New Directions for Adult and Continuing Education* provide a compendium of perspectives on how adult education might be improved by the study of neuroscience. “Neuroscience”, according to Lefton and Brannon (2006), “examines how biological factors affect mental processes and behavior and how behavior can change brain function and structure” (p. 13). The ability to modify brain function and structure can be conceptualized in terms of neural plasticity in which learning “... is dependent on the modification of the brain’s chemistry and architecture” (Cozolino & Sprokay, 2006, p. 11). The current article by Zull provides a neurological explanation of the relationship between behavior and learning.

Evolutionarily speaking, learning largely takes place in the newest part of the brain, the neocortex. The neocortex is the outer part of the brain and is most directly responsible for cognition (Zull, 2006). Cognition is the process of constructing knowledge, evaluating situations, and reaching conclusions (Lefton & Brannon, 2006).

Learning occurs as a result of sensory, association, and motor processes within the neocortex. Brain chemistry and new brain architecture combine to construct responses to environmental stimuli and associations. Associations are of two kinds, back integration associations (taking place in the back portion of the neocortex) and front integration associations

(occurring in the front part of the neocortex). Back integration is more immediate and is important for cognition (understanding). Front integration is required for planning and problem solving. Finally, motor processes can be of two varieties as well. Motor processes are either organized and planned or more deeply embedded and automatic.

### **Implications for Impact on Adult Education**

Zull (2006) presents a four pillar learning model based on the neurobiological evidence of how learning takes place. The four pillars of the learning model correspond to the four neurobiological processes. Sensory processes are elucidated in terms of *gathering*. That is, sensing provides data to the brain. Without associations; however, the data remain just that, data. The second pillar of learning; *reflection* is facilitated through back integrative processes that encourage the comparison of new and old experiences. *Creating* is the third pillar of learning and is a front integrative process. In this stage of learning, understanding from the back association processes combines with front association processes to form new theories and abstractions. Finally, in Zull's fourth pillar of learning, theories and abstractions are tested through the motor processes including those involving writing and verbal explanations of one's understandings.

### **Personal Opinion**

The neurobiological representation of knowledge construction makes sense in terms of other, older theories of learning. Bloom's taxonomy, for example, closely parallels that of Zull's last three pillars wherein Bloom's *knowledge, comprehension, application, and analysis* correspond to Zull's *reflection*; Bloom's *synthesis* might correspond to Zull's *creation*; and Bloom's *evaluation* is similar to Zull's *testing*. Another example is the learning theory offered in Nelson and Low's (2003) emotional learning system. Unlike Bloom's theory; however, Nelson and Low's theory also incorporates the sensory functions of the neurobiological model. Here,

data *gathering* (sensory) is represented in *self-assessment* using the Nelson and Low's ESAP. *Reflection* (back integration) is represented through *self-awareness* (identifying) and *self-knowledge* (understanding) activities. *Creation* (front integration) is provided for in *self-development* (learning) activities. Finally, *testing* (motor) is provided in *self-improvement* (applying and modeling) activities. An adaptation of Nelson and Low's emotional learning system is provided in Figure 1.

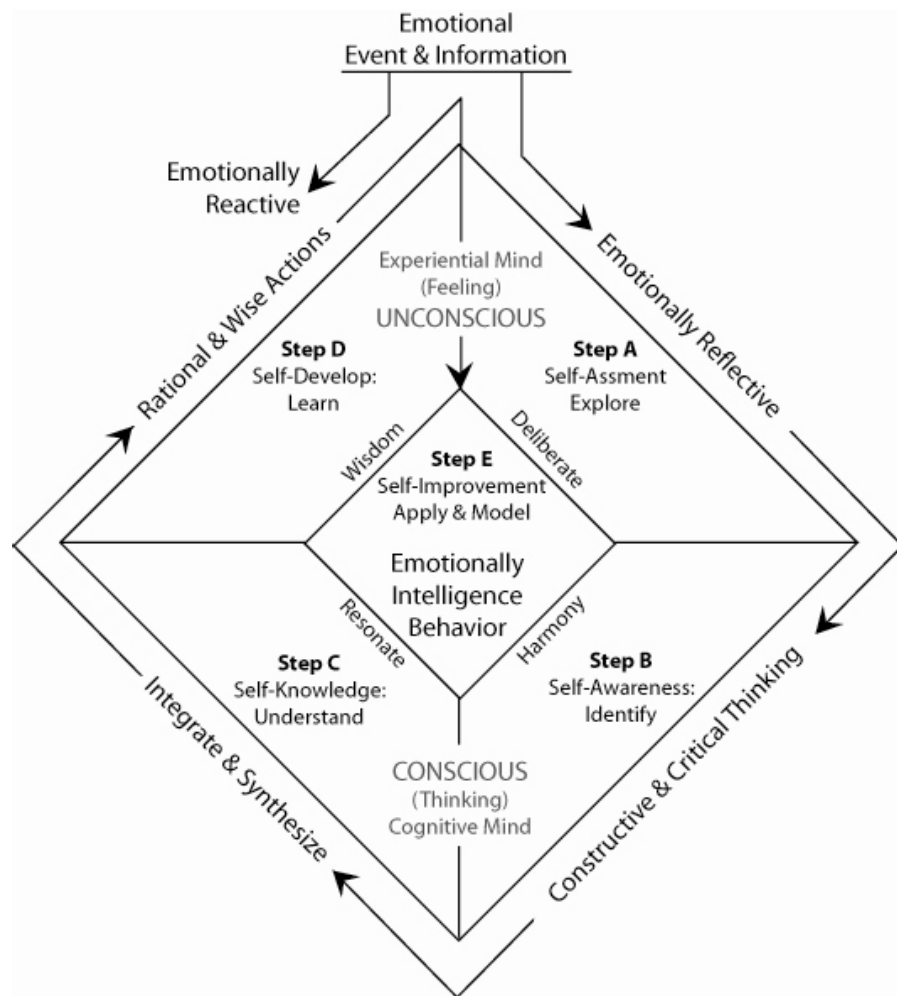


Figure 1. The Emotional Learning System - A systematic process that involves emotion for becoming more reflective and constructive in one's thinking.

## References

- Cozolino, L., & Sprokay, S. (2006). Neuroscience and adult learning. *New directions for adult and continuing education: The neuroscience of adult learning*, (110), 11-19.
- Lefton, L. A., & Brannon, L. (2006). *Psychology* (9th ed.). Boston, MA: Allyn and Bacon.
- Nelson, D. B., & Low, G. R. (2003). *Emotional intelligence: Achieving academic and career excellence*. Upper Saddle River, NJ: Prentice Hall.