

Piaget theorized that the formal operational stage of cognitive development begins during adolescence (Furth and Wachs, 1974). This stage marks the emergence of the capacity to theorize about possibilities and engage in high levels of abstraction (when connected to what is familiar), hypothetical thinking, and the understanding of propositions. The maturation of cognition during adolescence explains why adolescents can be reasoned with (though at times this can be quite a challenge for adults). All adolescents are capable of the maturation of formal operations, but as with all thinking and learning, environment and experience (at home, but more importantly for school-dependent students, at school) can shape the development of this type of thinking. Adolescents need explicit mediation in the application of the type of thinking inherent in formal operations for this ability to be optimally developed. With proper mediation, school-dependent adolescents can become highly adept at manifesting formal operations through a variety of high-level thinking processes, including analogous thinking, syllogistic thinking, and philosophical thinking. Without such mediation, this thinking remains underdeveloped in these individuals, impeding attainment of their full capacity for decision-making, hypothetical reasoning, dialogical thinking, and critical evaluation inherent in formal operations. Mediating formal operations requires making cultural connections to what is to be learned. Cultural experiences create references that affect how one sees relationships and makes connections, which is why culture profoundly influences the development of formal operations. Perceiving relationships strengthens bridges between neurons. Neurons communicate through the synapses, which are junctions between nerve cells where impulses pass from one neuron to another by means of chemical signals or neurotransmitters. These bridges are activated through skill development or enriching, mediated experience that strengthens neural connections (Holloway, 2003). All cultures have their own rituals and customs that the brain recognizes as repeated experiences. These culturally generated repeated experiences create a variety of specific neural patterns (i.e., ways the synapses connect neurons or facilitate communication between them). This explains why, although all brains have the same components, they are all wired differently, and why the way we process information (our cognition) varies as well, based on our

cultural experiences. The processing the wiring facilitates is manifested through intellectual behaviors, explaining why some intellectual behaviors are developed more strongly than others. The influence of culture on cognition clarifies why there are differences in what engages or enhances the learning of different individuals, a reality that must be appreciated and reflected in pedagogy in order to better engage and motivate learning. Through its impact on the development of neurological patterns, culture creates the frame of reference through which we perceive the world. This neuroscience perspective affirms why building on past experience is so important to cognitive development and the learning process.

Perceptions and emotions both emanate from personal cultural frames of reference. Emotions color the lens through which adolescents view the world, affecting every iota of the meaning they construct. This is another reality that can't be ignored. Emotions produce chemicals that affect learning. We know that cortisol (released in response to stress) impairs cognitive functions such as creativity and comprehension, where as dopamine and natural opiates such as endorphins (released in response to pleasure emanating from positive beliefs about self related to feelings of being valued or feelings of competence and confidence experienced from success and positive feedback) enhance motivation and learning. Adolescents are hyper-charged emotionally, the emotions of adolescents of African decent are compounded by race related issues (as discussed in Chapter III) and ignoring these emotions only works against the brain's ability to learn (Jensen, 1998; Sylwester, 2007; Wolfe, 2001).

REFERENCES

- Furth, H.G., & Wachs, H. (1974). *Thinking goes to school: Piaget's theory in practice*. Oxford: Oxford University Press.
- Holloway, M. (2003). The mutable brain. *Scientific American*, 289 (3), 79-85.
- Sylwester, R. (2007). *The adolescent brain: Reaching for autonomy*. Thousand Oaks, CA: Corwin Press.
- Wolfe, P. (2001). *Brain matters: Translating research into classroom practice*. Alexandria, VA: Association for Supervision and Curriculum Development.

Pedagogy of Confidence[®], Yvette Jackson, Ed.D.
Teachers College Press, 2011