The Biology of Learning

Plenary session with Dialogue Education Founder, Dr. Jane Vella and GLP Senior Partner Valerie Uccellani & GLP Partner Michael Culliton
Friday, October 25, 2013  |  9:00 am – 10:30 pm

Emerging research in neuroscience is expanding our understanding of learning. This research is revealing the biological—that is, physical processes—that occur in the brain as we learn.

James E. Zull, a leading researcher in the field, offers many important observations. Here are a few.

- Learning physically changes brains (p. 109*)!

- Effective learning is a process of helping people move from being receivers to producers. This requires designing learning events that balance information and scholarship with action and creativity (pp. 42-45).

- Feelings always affect memory. Feelings can help or hinder the biological process of learning (pp. 74, 86-87).

- In order to learn something, learners need to connect the new learning with something they already know. Learning is a biological process of building on and refining existing neural networks (pp. 101, 115-120).

- Metaphors, similes and analogies can help people learn abstract concepts. These help learners biologically “map” a new concept onto an existing neural network that stores prior knowledge of how something concrete – and that they already know – works (pp. 127-130).

- Learning – the building upon and refining of neural networks – is always a concrete experience and is especially enhanced by experiences that are sensory-rich and varied: images, sights, sounds, tastes, and touch (pp. 143-152).

Read a brief interview excerpt with James E. Zull on the following page.

Learning is Physical: A Brief Interview with Dr. James E. Zull, author of The Art of Changing the Brain

What follows is an excerpt from a longer interview done by Alvaro Fernandez at SharpBrains.com.

James Zull (JZ): Learning is physical. Learning means the modification, growth, and pruning of our neurons, connections – called synapses – and neuronal networks, through experience.

Alvaro Fernandez (AF): How does learning happen?
JZ: ...[We] 1) get information (sensory cortex), 2) make meaning of that information (back integrative cortex), 3) create new ideas from these meanings (front integrative cortex) and 4) act on those ideas (motor cortex). From this I propose that there are four pillars of learning: gathering, analyzing, creating, and acting. This is how we learn.

AF: Can we, as learners, motivate ourselves? How can we become better learners?
JZ: Great question, because in fact that is a uniquely human ability, at least to the degree we can do so. We know that the Frontal Lobes, which are proportionally much larger in humans than in any other mammal, are key for emotional self-regulation. We can be proactive and identify the areas that motivate us, and build on those. In other words, the Art of the Learner may be the Art of Finding Connections between the new information and challenges and what we already know and care about.

AF: What... tips would you offer to teachers and parents?
JZ: Always provoke an active reaction, ensuring the student is engaged and sees the connection between the new information and what he or she already knows. You can do so by asking questions such as “What does this make you think of? Is there some part of this new material that rings a wild bell for you?” To ensure a safe learning environment, you have to make sure to accept their answers, and build on them. We should view students as plants and flowers that need careful cultivation: growing some areas, helping reduce others.

AF: And what would you suggest for us who want to become better learners?
JZ: Learning is critical at all ages, not only in the school environment. We have brains precisely in order to be able to learn, to adapt to new environments. This is essential throughout life, not just in school. We now know that every brain can change, at any age. There is really no upper limit on learning since the brain neurons seem to be capable of growing new connections whenever they are used repeatedly. I think all of us need to develop the capacity to self-motivate ourselves. One way to do that is to search for those meaningful contact points and bridges, between what we want to learn and what we already know. When we do so, we are cultivating our own neuronal networks. We become our own gardeners.