

The Art of Changing the Brain  
by James E. Zull

A review by Rachel Esselstein

I was a bit nervous when I first picked up *The Art of Changing the Brain* by James E. Zull. The mathematician in me thought, "a book littered with biology terminology and diagrams is daunting and most likely won't be very useful for me as an instructor." After reading the first chapter however, I realized how wrong I was! Zull takes the classic learning cycle from Piaget, Kolb, and others and shows how it not only agrees with what scientists know about the brain but how the two theories actually explain each other. He claims that "biology can enrich what we already know," and that it is important for educators "to understand the physical process" by which learning occurs. In this way we can spend less time trying to "transfer ideas to our students... [and] put more energy into understanding the learner."

Zull remains mindful of his audience and regulates the doses of classroom anecdotes, education theory, and neuroscience in every chapter allowing all three categories to illustrate each other. In a chapter on neuronal networks Zull begins with a story about a student who was having trouble understanding protein folding despite her efforts to learn the material. He explains how she finally came to understand the concept when she saw a duck in a pond and she made an unusual but correct connection which ultimately helped her. Next, there is a biological discussion on how synapses are formed and why the student was able to draw on a seemingly unrelated experience to make a connection in that class. Zull finishes with some advice on how an educator may use this biology to improve learning. One suggestion he gives is using analogies and metaphors. The chapter culminates in a list of practical advice any instructor can use in the classroom to help students build strong neuronal networks. By the end of the chapter, I felt comfortable thinking about neuronal networks and was pleased to have some scientific context for the education theory.

Throughout the book there are pieces of practical advice for taking advantage of the biology of the brain while teaching. One piece of advice I find especially intriguing is in the chapter on encouraging students to use their senses while in the classroom. Zull describes how he emphasizes certain elements in complicated formulae by using color, size, and shape to draw attention to the important details. Certain symbols are always drawn in the same color or are humorously large which encourages the students to pay attention to the details he feels are important. He also describes how he emphasizes certain words while speaking to coincide with his embellished boardwork. Most of the advice in this book is similarly easy to implement and requires little more than a conscious effort on the part of the instructor.

*The Art of Changing the Brain* is a friendly and instructive book for all educators (even mathematicians). As Zull points out, it is vital to be able to put learning into context and to understand why and how people learn. Any reader of this book will find her outlook on education enriched and "may even begin to see herself as an artist, skilled in the art of changing the brain."