Enriching the Brain: How to Maximize Every Learner's Potential, by Eric Jensen. Jossey-Bass, San Francisco, CA, USA, 2006. xiv + 330 pp. ISBN: 0-7879-7547-8.

Eric Jensen's *Enriching the Brain: How to Maximize Every Learner's Potential* is part of the "brain-based education" movement. It addresses the growing interest by educators, policy makers, and parents for ready-made prescriptions for how to help children make the most of their school-age years.

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Jensen provides the interested reader a guided tour of several rapidly advancing fields, including cognitive neuroscience, developmental neuroscience, neuropsychology, molecular biology, and behavioral genetics. I refer to this as Jensen's *science* agenda. I found this part of the book to be most worthwhile. Jensen also attempts to show that these emerging fields of biopsychology lead to direct and specific recommendations for educational policy and practice. I found this explication of Jensen's *education* agenda less satisfactory. Building a bridge between neuroscience and educational practice is an elusive goal, one that often moves biological and behavioral scholars well beyond the comfort and protection of their well-specified models and experimental settings. Yet seeking out such a bridge is a perennial aim among scholars in both the science and education arenas since it has the potential to provide a more scientific basis for education practice and policy, while also delineating new areas of application for brain research.

Jensen uses *enrichment* as his core concept for organizing the central aspects of healthy brain development and for framing educational needs. Jensen goes to great lengths to debunk classical views of the fixed brain and fixed intelligence by selectively summarizing the vast research about the plasticity of genes and neurons from the fields of behavioral genetics and neuroscience. From a neural perspective, the enrichment approach helps us understand that the brains of *all* species are not fixed from birth or even fixed at early childhood, but continue to grow and develop in response to the environment. In fact, animals are such plastic creatures that they will tend to grow toward the features of their physical, social, and intellectual surroundings and, thus, become dull and rigid or bright and creative accordingly. The book also summarizes the rich literature that recasts intelligence along multiple dimensions, such as Robert Sternberg's triarchic theory of intelligence and Howard Gardner's theory of multiple intelligences, and shows the empirical evidence that IQ (and its related measure, *g*) does in fact change with tasks and settings.

Jensen is responsible in his portrayal of neuroscience findings, clarifying that many of the major claims for brain enrichment emerge from research conducted across various species (typically rodents and primates) that have been generalized across tasks with different qualities and synthesized across multiple research methodologies. In this way, he appropriately cautions the reader about drawing conclusions that could be out of reach for any particular species, task, or research paradigm. Jensen is also careful to explain that the interpretation of these enrichment studies showing enhanced growth of the brain can only be made *in contrast to* baseline conditions, where there is often little environmental or social stimulation. The types of enrichment that Jensen identifies range from physical activity (e.g., wheel running), engaging in novel and challenging activity, social interaction, proper nutrition, and spending sufficient time on task. This dispassionate approach adds greatly to the credibility of the science agenda pursued in the book and helps enormously to inform readers and makes them, ultimately, critical consumers of scientific information.

It is clear that the enrichment hypothesis shows promise. Rodent studies, the dominant source of findings on plasticity, show that enrichment can decrease the release of stress-inducing hormones, increase brain weight and connectivity (dendritic branching), improve memory for spatial cues, enable neurogenesis (neuron growth) and increase its rate, and facilitate recovery from injury. Numerous studies of humans also show neural growth (in contrast to the fixed-brain theory) as well as positive and lasting effects of enrichment on human neural development and cognitive behavior. For example, early childhood enrichment can show positive effects well into early adulthood, a finding that should add support to debates regarding the propagation of preschool programs.

One of the issues from the science agenda Jensen raises but does not resolve is the issue of a "critical period" of cognitive and neural development. John Bruer (1993, 1996), president of the James S. McDonnell Foundation, a major source of funding for research in cognitive

neuroscience, has forcefully argued that several myths have been perpetuated about the relation of cognitive development to observed periods of rapid neural development. Jensen argues that Bruer's claims are untestable, but gives no more elaborate or insightful treatment to this all-important issue for the scientific foundation of brain-based education. One assertion from Bruer is that it is very difficult to draw educational principles *directly* from the neuroscience results, and one needs a field like cognitive science to mediate between them, interpreting the biological and behavioral data and understanding the landscape of learning theory and educational practices and policies. While this is not specifically addressed by Jensen, I felt this claim received implicit support in several places in the book.

The educational agenda of the book, broadly speaking, seeks to prescribe practices and policies that can, as stated in the subtitle, maximize every learner's potential. Most scholars of contemporary science education will feel comfortable rallying around many of these recommendations. They emerge from Jensen's "Seven Golden Maximizers," which are physical activity; novel, challenging, and meaningful learning; coherent complexity; managed stress levels; social support; proper nutrition; and sufficient time to learn, develop, reflect, and rest. However, many of the specific maximizers—such as creating safe, supervised settings for children to play in, trading social interaction for TV watching, providing ample recess, and managing teenagers' penchant for risky behavior—fall under an umbrella of common sense that has long preceded, though may now be compatible with, findings from contemporary neuroscience. And here, for me, is the rub with respect to the educational agenda: I could not see how the body of scientific evidence ruled out competing frameworks that lead to many of the same recommendations. For example, there were no unintuitive recommendations that would highlight the unique contributions of neuroscience. It is as if, by drawing on this emerging body of research, we seem to arrive right where many reformers say we ought to be, in a place that has long been supported by a collection of behavioral evidence, folk psychology, and practical knowledge.

Although I had trouble tracing a direct line from the neuroscience research to the educational recommendations, I found Jensen's policy recommendations to be among the most exciting portions of the education agenda. He sets out to explode the myth that low achievers cannot progress beyond the performance of their typical peers. Chief among his enrichment-driven recommendations is the explicit conceptualization of *all* learners as "special," and, therefore, deserving of, even requiring, individual educational plans (IEPs) throughout their schooling. Along with this, Jensen emphasizes classroom practices that focus on understanding one's students and helping them to understand themselves, using differentiated instruction, and exploring expansive curricula that emphasize distributed sources of knowledge, social interaction, and project-based learning. Scholars of current educational reform will recognize these, to be sure, as part of the current wave of contemporary education, summarized most succinctly in the *How People Learn* series from the National Research Council. Perhaps a bit more radical, Jensen also calls for self-paced, mastery learning as the rule of the day and would dispense with grades in favor of performance-based promotion.

Jensen is sensitive to the potential reactions to some of his more radical recommendations. He understands that teachers, administrators, parents, and even students feel the pressures of high-stakes testing and competition of college placement. But he seeks to reframe these reactionary responses and asks educators and parents to put the focus on enrichment foremost. Enrichment translates to contrasting learning events that emphasize "novel, meaningful, challenging, learning." In this way, Jensen is asking us to prioritize our educational values, and to do so in a student-centered manner. However, others read the scientific support for these educational recommendations, this is the right objective, and

this book has the potential to elevate the discourse of what we should be doing in schools and at home to support the healthy development of our children.

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