Kirtley Thornton has composed a striking book documenting research conducted in the fields of neurofeedback and education, including his own research and professional experiences as a clinician and researcher. He has successfully blended enormous amounts of evidence and provided a solid case for a paradigm change in the school system, especially when addressing the learning disabled population. This paradigm is a resourceful theoretical and empirical contribution to a number of our institutions in need of a change or expansion into new frontiers. Thornton directs the attention of the reader to a major, long-standing problem in our society, which became even more relevant after the enactment of the No Child Left Behind legislation, a societal challenge with no real solution until now.

Thornton offers compelling evidence about various positive outcomes in the school system, which would become possible if the neurocognitive approach (electroencephalography [EEG] biofeedback) were to be implemented in the schools. He has convincingly presented the argument that the neurocognitive approach is a powerful way to meet the learning disability challenge.

What does Dr. Thornton do, and why is the approach so powerful? He conducts original research and implements new empirically based applications in the field of neurofeedback, principally aimed at students with learning disabilities and individuals with traumatic brain injuries. For those who are reading the Biofeedback magazine for the first time or those who are new to the biofeedback arena, neurofeedback is the science of improving the electrophysiology of the brain and concomitantly obtaining positive changes in the behavioral-cognitive repertory of the student.

As a result of his extended research, Thornton arrived at the conclusion that a new paradigm in the field of neurofeedback is emerging: the neurocognitive approach.

The neurocognitive approach includes a number of conceptual and technical innovations:

1. a widening of the EEG frequency range for data acquisition, analysis, and feedback;
2. a new form of quantitative EEG (QEEG) data acquisition that allows better access to identifying the electrophysiological variables and brain regions that may be involved in the child’s cognitive limitations;
3. a database that incorporates the most recent findings;
4. an extended form of QEEG data analysis that facilitates identifying deficits and broadens the alternative approaches for remediation or improvement; and
5. an appreciation of the need for unique, individualized protocols for neurofeedback treatment, which address the neural and cognitive system as an integrated functioning system with specific and multiple variables relevant to success in particular tasks.

The neurocognitive approach allows for the definition of the relationship between effective cognitive activity and electrophysiological variables, which increase the cognitive effectiveness of the human mind through an operant conditioning of the brain’s electrophysiology.

In chapters 1 through 3, Thornton summarizes national educational research and extensively discusses the current educational situation with respect to current intervention models in special education and the learning disabilities/attention deficit hyperactivity disorder problem. In chapters 4 through 6, he explains the neuroscience evidence on learning disabilities/attention deficit hyperactivity disorder and traumatic brain injury, and in chapters 7 through 9, he summarizes the social consequences and costs for society of these conditions. In chapters 10 through 16, Thornton summarizes progress to date in understanding and managing these learning problems and recent progress in research in...
neurofeedback and the neurosciences. In chapters 17 through 22, the author incorporates more evidence and research reports from the social, educational, and clinical fields, explaining how neurocognitive interventions can overcome many shortcomings in these areas. The last chapter overviews some positive outcomes resulting from the application of the neurocognitive approach.

The educational discussion can be summarized by the following question posed by the author: “What right do we have, as professionals and as educators, to offer less than what we are capable of to these children?” The author shows the effect of the neurocognitive approach on the student’s IQ and argues that it is possible to obtain an IQ increase of 1 standard deviation. Dr. Thornton has documented that an increase of 1 standard deviation in IQ scores will have a major positive impact on the individual’s life as well as on the nation in which he or she lives.

The book reports Thornton’s direct work and participation for many years in the educational communities in Chicago, New York, New Jersey, and Philadelphia, raising awareness among the communities of the benefits of neurofeedback by organizing educational activities and participating in meetings, conferences, and workshops.

Thornton concludes that it is crucial to implement the neurocognitive approach in the special education system during the early years of a child’s educational experience. Implementing this approach will significantly reduce the child’s adverse perception of the classroom situation and reduce the pain and tribulation of the families involved. Furthermore, the approach will allow the educational system to obtain savings of nearly $327 billion per year.

Thornton introduces several modifications in the treatment protocol for learning problems. He proposes rewarding EEG activity in the high-frequency range of 32 to 64 Hz. In chapter 11, Thornton explains how he explored new information and correlations in the range of 32 to 64 Hz (describing it as the frequency that was overlooked). He presents evidence that rewarding this high-frequency range (providing rewards for relative power and coherence variables) can produce statistically significant changes in the reading and auditory memory of students. He then introduces coherence training and conceptualizes the coherence and phase relationships between locations in terms of a generator emanating from a particular location.

He labels this generator as a “flashlight generator”, a term he coined. This idea is used in the statistical analysis of the data and in guiding the intervention protocols.

Thornton also introduces a new procedure for data acquisition in QEEG evaluations: the activation QEEG evaluation procedure, which is described in chapter 13. Thornton conducted research in this area to address the limitations of the previously used eyes-closed evaluation approach to assess cognitive function. Following Thornton’s activation approach, the practitioner engages the subject in relevant cognitive tasks such as reading, auditory and reading memory, problem solving, and math problems and examines the relationship between success at the task and the QEEG variables. This procedure represents a remarkable attempt to solve the previously defined limitations on the eyes-closed approach and identifies the QEEG variables relevant to specific cognitive tasks. Thornton supports his new intervention protocol by presenting research results, case studies, and a set of brain-mapping figures.

Furthermore, the author compares the outcome of the QEEG activation condition (QEEG under a task condition) versus the eyes-closed condition: The activation condition produces 7-day test-retest reliabilities that are higher than those of the eyes-closed condition. In other words, reliability varied more during the resting condition. The author explains this by saying that the cognitive activation task elicits a more similar electrical response pattern across time than the eyes-closed condition.

This book is unique in the field of neurofeedback, a must read in general for everyone interested in neurofeedback or education and particularly for those working on research on learning problems and traumatic brain injury. Thornton convincingly shows to the scientific community that research in neurofeedback has just begun.

Finally, I invite readers to visit www.amazon.com and read the reader reviews of this book. There you will find the assessments of this book by three reviewers (Henry A. Malone, Elizabeth Shanshala Stubbs, and Gary Ames). Please take a particular look at Gary Ames’ comments. Ames writes that “at the inception of its release, this book already has an auspicious history” and reports that he shared this book with representatives of the federal Department of Education, who were impressed enough to apply for further study of neurofeedback applications in education.