

# *Five Big Ideas for Effective Teaching*

---

*Connecting Mind, Brain,  
and Education Research  
to Classroom Practice*

---

*Donna Wilson  
Marcus Conyers  
Foreword by Robert Calfee*

# Contents

<i>Foreword by Robert Calfee</i>	vii
<i>Acknowledgments</i>	ix
<i>Introduction</i>	1
<i>Teacher Education and Professional Development:     Preparing, Developing, and Supporting Teachers     by Providing Them with a Firm Foundation</i>	1
<i>Teachers as Learners</i>	4
<i>Five Big Ideas from Research to Application</i>	5
1. <i>Challenges and Opportunities in 21st Century Schooling</i>	9
<i>In Support of a Gold Standard for Educational Professionals:     Teachers as Adaptive Experts and Lifelong Learners</i>	12
<i>Challenges in the Current System of     Teacher Education and Schooling</i>	12
<i>Tools for Learning and Teaching in the 21st Century</i>	14
<i>Brain, Plasticity, Potential, and Intelligence</i>	15
<i>The Body-Brain System</i>	17
<i>Metacognition</i>	19
<i>The Challenges of Teaching Today</i>	21
<i>Opportunities Knock for Lifelong Learners</i>	24
<i>Connecting the Science of Learning to the Art of Teaching</i>	26
2. <i>BIG IDEA 1: Implications of Neural Plasticity     for Learning and Teaching</i>	28
<i>Understanding the Science of Neural Plasticity</i>	30

	<i>Brain Development Over the Life Span</i>	33
	<i>Plasticity Research and the Classroom</i>	37
	<i>From Research to Classroom Practice: Plasticity in Action</i>	41
	<i>What's the Big Idea?</i>	44
3.	<i>BIG IDEA 2: Recognizing Human Potential</i>	48
	<i>Misunderstanding Potential: The Fixed Mindset</i>	50
	<i>Defining Potential in the Classroom</i>	52
	<i>Teacher Expectations About Their Students' Learning Potential</i>	54
	<i>Educational Leadership: Beyond the Classroom</i>	60
	<i>From Research to Classroom Practice: Guiding Students to Actualize Their Learning Potential</i>	62
	<i>What's the Big Idea?</i>	63
4.	<i>BIG IDEA 3: Understanding Intelligence</i>	65
	<i>Conceptions of Intelligence</i>	68
	<i>Dynamic, Changeable Intelligence</i>	73
	<i>Malleable Intelligence and Student Learning</i>	74
	<i>Malleable Intelligence, Motivation, and Effort</i>	76
	<i>The Role of Deliberate Practice</i>	79
	<i>Using Formative Assessment for Intelligence Building</i>	81
	<i>Educational Leadership: Beyond the Classroom</i>	82
	<i>From Research to Classroom Practice: Intelligence for 21st Century Success</i>	83
	<i>What's the Big Idea?</i>	90
5.	<i>BIG IDEA 4: The Body-Brain System at Work for Learning</i>	93
	<i>Stronger Bodies, Sharper Minds</i>	94

<i>The Search for Causal Connections</i>	97
<i>High-Octane Fuel for Learning</i>	99
<i>The Emotional Aspects of Learning</i>	101
<i>Modeling and Teaching Optimism</i>	103
<i>Preparing for Learning with a Good Night's Sleep</i>	104
<i>From Research to Classroom Practice: Putting the Body-Brain System to Work</i>	105
<i>What's the Big Idea?</i>	108
6. <i>BIG IDEA 5: Metacognition as a Path to Becoming Functionally Smarter</i>	110
<i>Metacognition Through the Ages</i>	112
<i>Thinking About Thinking: Two Layers of Learning</i>	112
<i>Connecting Metacognition and Executive Function</i>	114
<i>Teaching and Facilitating the Use of Cognitive Strategies</i>	117
<i>Connecting Cognitive Strategies to the Common Core State Standards</i>	118
<i>Gathering Information</i>	119
<i>Exploring and Elaborating</i>	123
<i>Communicating What You Have Learned</i>	129
<i>Teaching Cognitive and Metacognitive Strategies by Example</i>	133
<i>From Research to Classroom Practice: Learning by Teaching and Reflecting on Your Professional Practice</i>	135
<i>What's the Big Idea?</i>	137
7. <i>Teaching, Learning, and Neuroeducation Myth Busting</i>	140
<i>Becoming an "Apprentice" of Effective Education</i>	141
<i>There Is More to 21st Century Education Than the 3 Rs—A Lot More</i>	142
<i>You Can Get Better at Almost Anything If You Set Your Mind to It</i>	144

<i>Your Brain Is a Learning Muscle—Build It</i>	145
<i>Early Intensive Reading Instruction Can Open New Worlds</i>	146
<i>The Little Engine That Could Had the Right Idea</i>	147
<i>Don't Forget: You Can Remember</i>	149
<i>Support Physical Activity to Support Learning</i>	152
<i>Your Role as a Myth Buster</i>	153
8. <i>Your Journey of Learning and Teaching</i>	154
<i>The Importance of Learning Together</i>	155
<i>Connecting with a Worldwide Professional Learning Community</i>	162
<i>The Joy of Informal Learning</i>	164
<i>Rising to the Hope and Challenges of Your Professional Practice</i>	165
<i>References</i>	168
<i>Index</i>	184
<i>About the Authors</i>	196

## Challenges and Opportunities in 21st Century Schooling

*Teachers make a difference. Indeed, of all the factors that education leaders can control, the quality of teaching has perhaps the greatest potential effect.*

—Committee on the Study of Teacher Preparation Programs  
in the United States and the National Research Council,  
*Preparing Teachers: Building Evidence for Sound Policy*, p. 9

---

*What do you think represents the most significant challenge and greatest opportunity in education today?*

---

Every day we are inspired by stories of teachers who are applying the implications of research and the latest strategies in the classroom, and by the students who are benefiting from these innovative approaches. These teachers' commitment to their students' success is exemplary, and their enthusiasm is evident in the stories they share: the Oklahoma 2nd-graders who demonstrate their favorite reading comprehension strategies for students in New Zealand through a video blog, the Georgia middle schoolers who are excited to show how metacognition helps them take charge of and improve their academic performance, or the California 8th-graders who use various strategies to aid in meaning-making and recall of key science concepts. The best teachers also share how they apply what they have learned about the science of learning to their own professional and personal lives.

But these kinds of stories too seldom make their way into the public discourse about education. Instead, we are told by policymakers and

news organizations that our school system is not what it once was: The United States lags far behind other countries, the achievement gap for poor and minority students continues to widen, and schools cannot meet rigorous new standards. Yet the teachers in the classrooms described here and throughout this book are committed to making a positive difference in guiding their students to achieve more of their academic potential. They approach their work with confidence and enthusiasm because they know they have the tools needed to improve their practice, and they are committed to ongoing learning necessary to keep pace with the changing demands of their profession.

In 2000, the National Research Council report *How People Learn* (Bransford, Brown, & Cocking, 2000) highlighted the ways in which learning changes the brain and suggested approaches for increasing student achievement. Since then, a few universities have begun offering degree programs for educators that combine mind, brain, and education research; among them are Harvard University; Nova Southeastern University; and the University of Texas, Arlington (Sparks, 2012). Journals such as *Scientific American Mind* and *Mind, Brain, and Education* share research from this new field. This transdisciplinary approach is transforming the way we think about education.

Mind, brain, and education studies began to develop around the world in the early 21st century (Tokuhamas-Espinosa, 2010, 2011a). The International Mind, Brain, and Education Society (IMBES) was formed in 2003, in part, to provide “support for the interest in brain-based education” (Miller & DeFina, 2010, p. 142); the IMBES website (<http://www.imbes.org>) sets out its mission to “facilitate cross-cultural collaboration in biology, education and the cognitive and developmental sciences.” Major conferences in countries like Japan, the United States, and the United Kingdom provide opportunities for researchers and practitioners across disciplines, including the cognitive sciences, neurobiology, and education, to share knowledge and establish new ways of working together (Battro, Fischer, & Lena, 2008). Scholars working in the field of mind, brain, and education are often characterized by a willingness to share knowledge with others outside their original disciplines, a recognition of the need to adapt professional language in order to communicate with others outside their immediate field, and a belief that linking information across disciplines is beneficial for themselves and others (Tokuhamas-Espinosa, 2011a).

### To Learn More

*Tracey Tokuhama-Espinosa, professor of education and neuropsychology at the Universidad San Francisco de Quito in Ecuador, has conducted research in the mind, brain, and education field using a Delphi panel format to facilitate the exchange of information among experts around the world in various related disciplines. This research is the basis for her book *The New Science of Teaching and Learning: Using the Best of Mind, Brain, and Education Science in the Classroom* (Teachers College Press, 2010).*

The mind, brain, and education field includes findings from educational neuroscience, sometimes referred to as *neuroeducation*, which has been defined as “an emerging effort to integrate neuroscience methods, particularly functional neuroimaging, with behavioral methods to address issues of learning and instruction” (Varma, McCandliss, & Schwartz, 2008, p. 140). Practitioners may also draw from the discipline of school neuropsychology, an emerging area within school psychology (Miller, 2010). Research and principles from these fields have practical implications for classroom instruction. For example, Berninger and Richards write that a basic understanding of key neuroscientific concepts may prove useful for teachers, including

normal variation within and across students and in individual student learning outcomes, nature-nurture connections, learning as developmental, multiple codes and modalities of representation, alternative pathways in learning, potential for building multiple and alternative connections in the brain, alternative instructional approaches for achieving the same learning result, and functional systems with numerous, interacting components. (2002, pp. 317–318)

Especially as the mind, brain, and education field gathers momentum, this is an incredibly exciting time to be an educator. While we do face challenges, the knowledge we need to overcome them is within our grasp—and we have every reason to hope and believe that, given the proper approach, our schools and classrooms can fulfill their promise of helping every child learn and succeed.