Brainology: Using Lessons from Basic Neuroscience

by Mark Katz, PhD

"TRY HARD." "DON'T GIVE UP." "IF YOU MAKE A MISTAKE JUST TRY AGAIN." Can these resilient qualities be learned? Apparently so, according to Stanford University psychology professor Carol Dweck—if we can first learn to see human intelligence as malleable, not fixed.

Parents, educators, health-care providers and well-informed consumers are finding creative ways to address the needs and daily challenges of those who struggle with AD/HD. In each issue of Attention, *we highlight one innovative program, model, or practice and pass on appropriate contacts so you can implement similar efforts in your community. Appearance in this column, however, does not imply endorsement by CHADD.*

When it comes to defining what it means to be smart, Dweck's research shows that most of us have one of two mindsets. Those with a "fixed" mindset believe that intelligence exists in a set amount from birth and cannot be changed. When such people make a mistake, they see it as a reflection of how "smart" they are. Their solution? Avoid making mistakes. As a result, they may give up far too soon on things if they fear they might fail and don't persist at things once mistakes occur, all in the interest of feeling and looking smart in their own eyes and in the eyes of others.

On the other hand, those with a "growth" mindset believe that intelligence is malleable and can be improved through their own efforts. They view their potential as unlimited, depending, of course on how hard they choose to work and how much they choose to learn. People with this mindset tend to see mistakes, failures, and setbacks not as experiences to fear but rather as lessons from which to learn and grow. The good news, says Dweck, is that research shows we have it within our power to change our mindset. Those with fixed mindsets can learn to see themselves through a growth mindset, regardless of age or background.

So how exactly do we go about changing something as abstract as a mindset? For children in middle school, at least, Brainology may be a start. The web-based interactive program teaches students to see their abilities as malleable, and to view mistakes and setbacks as learning experiences. Pilot data compiled on more than three hundred middle-school students in New York City is impressive. A number of children who began the program with fixed mindsets finished the program with growth mindsets. Motivation at school also increased, and specific academic gains were reported. In the study, lessons were instructor-supported rather than purely software-based. [See Blackwell, L.S., Trzesniewski, K.H., & Dweck, C.S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and intervention. *Child Development, 78*(1), 246-263.]

Drawing from neuroscience

Neuroscientists have found that the human brain is much more malleable than previously thought. We now know, for example, that the brain physically changes and adapts in



BRAINOLOGY Program Units

UNIT 1: Brain Basics introduces basics of brain structure and function, including how we sustain attention and concentration. Students are also introduced to thinking and learning processes that underlie a growth mindset.

UNIT 2: Brain Behavior explains how chemical messengers in the brain allow cells to communicate with one another. Students also learn how emotions can influence the brain, and ways they can increase positive emotions and reduce negative ones. Students experiencing test anxiety may find this unit particularly helpful.

MORE INFO: For a list of references and helpful resources, visit **www.chadd.org/attention/references.**

response to the experiences of daily living. People of all ages are capable of creating new neuronal pathways (strengthening their brains) if they're willing to expend the effort and challenge themselves.

Brainology draws heavily on these and other findings to help students, and all of us for that matter, realize the amount of control we have over how much we learn and grow, now and in the future. Says Dweck, "Brainology is like an owner's manual for the brain.... When you buy an appliance, you get an owner's manual. Why not have one for the human brain, one that shows you how to make it work better so that you get smarter?"

How the program works

Brainology is interactive, fun, and stimulating, but also challenging. Students participate in a series of lessons where two animated middle-school aged characters serve as program guides while confronting and tackling problems occurring in their most difficult subjects. They're helped by an eccentric brain scientist, an animated character named Dr. Cerebrus. He teaches them about the functions of the human brain, including how thinking occurs, how learning and memory work, how we can develop and change our own brains, and most importantly, how we can use knowledge of the brain and its functions to improve study habits and do better in school. Through interactive activities and exercises, students also have a chance to practice visualizing and applying these ideas.

The program begins with an introductory unit in which students learn about the goals of the program and meet the animated characters. Students also start an e-journal, an online tool allowing them to log specific school challenges, as well as personal thoughts, ideas, and lessons learned as they progress through the program.

The program includes a guide for teachers or parents, showing how to start the program, ways to reinforce strategies in the classroom, and a brief overview of supporting research. Brainology requires a computer and Internet access. Headphones or speakers are also required for the audio portions.

Fixed vs. growth mindset

Brainology's lessons extend well beyond middle school. Studies show that a fixed mindset can negatively impact our most important personal and professional relationships, and even lower the goals we set for ourselves. Burdened by a fixed mindset, we're constantly trying to prove our worth, only doing things that make us look smart, and avoiding mistakes at all cost.

Choosing a growth mindset, we're challenging ourselves and learning from our failures. But most importantly perhaps, we're now also realizing that with the right amount of passion, toil, and training, we really don't know what we're capable of becoming, as Dweck writes in *Mindset: The New Psychology of Success* (Random House, 2006).

Those interested in learning more about Brainology can do so by logging on to the Web site, www.brainology.us. Links are also provided to several articles highlighting Dweck's work for those interested in learning more about the research supporting the Brainology curriculum. A

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Brainology's animated character Dr. Cerebrus teaches students about the brain and how we can use knowledge of brain functions to improve study habits.

UNIT 3: Brain Building uses illustrations to show how, by learning and practicing new skills, the areas of the brain responsible for those skills actually become larger and denser with neural tissue, and new areas of the brain become active when performing related tasks. Students see that the human brain is actually malleable, not fixed, which is key to developing a growth mindset. Through mental exercise, students also learn that intelligence can be developed.

UNIT 4: Brain Boosters extends principles underlying the brain's malleability to memory functions. A variety of study strategies are also introduced to further enhance students' understanding of the growth mindset.