BRAINOLOGY®

Introduction

Building Students' Confidence, Fulfillment and Achievement
Through the Understanding of Expandable Intelligence

INTRODUCTION TO BRAINOLOGY®

Helping Students Become Lifelong Learners

Curriculum Goal

The goal of the Brainology® software is to raise student achievement by helping students develop a growth mindset whereby they think of their intelligence as something they develop through study and learning rather than as something fixed. That understanding increases their sense of self-efficacy, motivation to learn and outcomes. We approach this by teaching students how the brain functions, learns, and remembers, and how it changes in a physical way when we exercise it. Students gain the insight that it is up to them to develop their brain. In addition, the program provides a practical set of study skills for tackling academic challenges by showing students how to apply this knowledge to their schoolwork.

Structure of the Program

Brainology® is designed as an online, challenge-based, interactive multimedia instructional program. In an introduction plus four ~30 minute units, students follow animated teenaged characters Chris and Dahlia as they tackle various problems in their most difficult subjects. Students visit the lab of eccentric brain scientist Dr. Cerebrus and learn about the basic structure and function of the brain: how thinking occurs, how learning and memory work, how to develop and change the brain, and how to improve their study habits and skills in light of this knowledge. The students gain experience in visualizing and applying these ideas through interactive activities and exercises. They also reflect on their own challenges and learnings through the use of an e-journal. The goal is for them to understand that they have great untapped potential and that the development of their mental ability is largely within their own control, as well as to provide them with study habits and skills that will help them take action.

FIGURE 1: MAP USED TO NAVIGATE THE PROGRAM

Students begin the program with an **introduction to the program** in which they are presented to the program and its purpose, to the characters that will guide them throughout the program and to the tools available (the e-Journal, Map, Brain Book and Help). They also create an inventory of their own personal challenges so they start reflecting on their own situation and can more easily relate the Brainology® lessons to their real life.

FIGURE 2: CHRIS, DAHLIA AND DR. CEREBRUS

After the introductory session (usually on a different day), students begin **Unit 1: Brain Basics**. In this unit, students learn the basics of brain structure and function, particularly what is required to maintain readiness to learn and how attention and concentration are supported. This unit prepares students both for higher-level understanding of thinking and learning processes that underlie a growth mindset, and for more advanced study strategies.

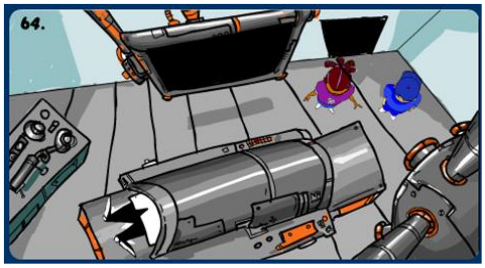

FIGURE 4: VISIT TO DR. CEREBRUS' LAB TO DO RESEARCH

In **Unit 2: Brain Behavior**, students learn that the brain functions by sending chemical messages through a network of nerve cells, and that these cells are responsible for thought. This insight provides a foundation for understanding how learning changes the brain. They also learn how emotions can influence the brain and are taught strategies for managing their negative emotions and enhancing the positive ones.

In **Unit3: Brain Building**, students discover how learning changes the brain through the growth of connections in neural networks with repeated use, the key to the growth mindset. Students learn that intelligence can be developed through mental exercise, and what sorts of activities promote learning.

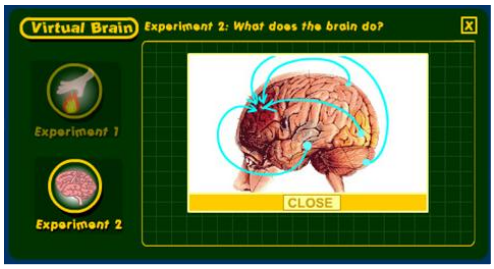

FIGURE 3: BRAIN EXPERIMENT

Unit 4: Brain Boosters, extends the concept of the malleable brain to understand the processes of memory. The unit introduces a variety of study strategies to capitalize on the way the brain works and learns, to deepen and reinforce the students' understanding of the growth mindset and guide the student to the study skills resources.

After each computer session students and teachers engage in rich classroom discussion on the material and its application. Sessions are generally spread one week apart, so that students can apply what they are learning to their daily life in-between sessions.

The program also comes with resources to help reinforce the Brainology® lessons and support children in their development of a growth mindset in school and in life. These include:

- a Teachers' Guide or Parent's Guide which includes an introduction to the curriculum, an outline of the goals, lessons, common challenges and reinforcement strategies for each unit and an overview of the research
- summary handouts and assessment quizzes that can be used after each unit
- the Brainology® Study Tips summarizing the main ways students can improve their studying techniques, and
- the Brainology® Study Plan for children to design and track their own study improvement plan upon completion of the program.

Student Testimonials

"What I learned different is that you could be scared sometimes in a school subject but do not give up—keep studying and you could find your way through it."

"After Brainology, I now have a new look at things. Now, my attitude towards the subjects that I have trouble in [is that] I try harder to study and master the skills that I have problems in. I have been using my time more wisely, studying every day and reviewing the notes that I took on that day. I am really glad that I joined this program because it increased my intelligence about the brain."

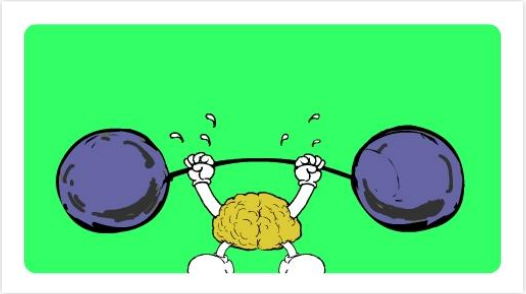

FIGURE 5: THE BRAIN IS LIKE A MUSCLE

"Yes I have changed my mind about a lot of things. I concentrate better on tests as well as homework. I have also been very responsible, and I know I can do what I put my mind to."

"What I have changed my mind about because of the Brainology program was giving up. I used to give up easily and now I keep on trying."

"YES!!! This program helped me because I used to be like "I can't do this—why is this so hard? I'm gonna fail," but then I started to believe in myself and started saying things like "I'm gonna pass" and I passed the STA—only the hardest test in the world. It was long but Brainology helped a lot. My favorite thing from Brainology is the neurons part where when you learn something there are connections and they keep growing and growing. I always picture that when I'm in school. Another favorite is the new study tips that i have learned. What I will do differently is study because I used to just memorize and when it got too hard I'd quit. Now I'm gonna memorize and make up little mnemonics to help me out."

"I did change my mind about how the brain works and I will do things differently. I will try harder because I know that the more you try the more your brain works."

"Yes I have changed that whenever there is a test I will study very hard and I will try hard to get a good grade no matter how hard the subject is. Yes I will do something differently I will study more like I just said. Thank you for making us study more and helping us build up our brain! "

"Yes, I imagine the neurons making connections in my brain and I feel like I am learning something."

"The brainology program made me change my mind about math. I used to hate math and thought it was difficult. Now, I think it's easy and that if I keep trying, I will do good. What I will do differently is do more practice, study as much as I can, and think positive."

"Now I know that if something in school is difficult, if I work extra hard on that particular subject, and study properly, I can do well. If I have a positive way of thinking I know I will do better. Thank you Brainology! Brainology is cool. Yay!"

Teacher Testimonials

"Your workshop has already had an effect. L., who never puts in any extra effort and often doesn't turn in homework on time, actually stayed up late working for hours to finish an assignment early so I could review it and give him a chance to revise it. He earned a B+ on the assignment (he had been getting C's and lower)."

FIGURE 6: CHRIS & DAHLIA DOING BRAIN RESEARCH

"M. was performing far below grade level. During the past few weeks, she has voluntarily asked for extra help from me during her lunch period in order to improve her test-taking performance. Her grades drastically improved from failing to an 84 on the most-recent exam."

"Lately I have noticed that students have a greater appreciation for improvement in academic performance. R. was performing below standards, but now he has learned to appreciate the improvement from his grades of 52, 46, and 49 to his grades of 67 and 71. He valued his growth in learning Mathematics."

"Several students have voluntarily participated in peer tutoring sessions during their lunch periods or after school. These students were passing when they requested the extra help and motivated by the prospect of sheer improvement."

"One of the most pronounced problems some of our kids with high skills have is test anxiety, so the strategies in Unit 2 were really useful to the children with chronic anxiety problems. Many of the observably more able students have been coasting through math over the last few years as they've been in non-tracked, general population classes until the 7th grade. Then they're surprised by the

newness of the algebra curriculum and many of them stumble at first as their relatively unused study skills are called upon. The structure of the Brainology curriculum as related to study skills and different ways of learning was a boon to this particular part of our student body."

"Reflecting this enhanced motivation, students who participated in the program showed an upturn in their grades after the intervention. In contrast, the grades of a similar group of students who had a different curriculum continued to decline during the same period."

"Students are more stimulated to perform a task, knowing how the brain operates and functions. Students' participation orally and in writing has increased. The Brainology curriculum has positively influenced students' perceptions of intelligence. This in turn has resulted in an increase in skill development."

"Children are more willing to ask for support when they believe that their intelligence is malleable. They are more motivated to learn."

"I was surprised to see that some of the students with the highest grades and most consistent performance in the class listed math as a subject about which they are concerned. Just like the students, sometimes I have to remind myself what grades, scores, and school work represent. It is not always the case that these three items equal understanding and even less likely are they tokens for confidence."

"The program did help to remind me that I have to be more patient because learning takes a great deal of time and practice."

"I think it's been helpful to be reminded that all students can learn, even the ones who struggle with math and with self-control."

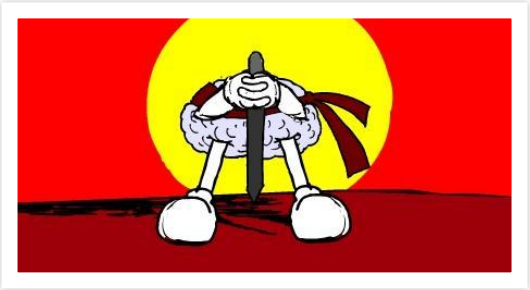

FIGURE 7: BECOMING A BRAIN MASTER

For more testimonials see: http://www.brainology.us/program/testimonials.aspx

Technology Requirements

The Brainology® program requires a computer with an internet connection for each student and a means for the student to listen to the computer audio (i.e. a headphone or speakers). A broadband internet connection is preferred but the program will also work with a dial-up internet connection after a few minutes of preloading. The program is accessed with any browser with the Adobe Flash Player plug-in version 8 or higher (which is freely available and already installed in 98% of computers).

For more information

If you're interested in purchasing the Brainology® program or would like more information, please contact us at info@brainology.us or 1-888-344-6463 or fill out the form at http://www.brainology.us/webnav/contact.aspx.

Growth Mindset Research

Over the past two decades, the main goal of two of our co-founders, Carol S. Dweck, Ph.D., and Lisa Sorich Blackwell, Ph.D., has been to research what helps students to achieve highly, and to apply the lessons learned to improving their motivation and achievement.

Achievement Motivation

In Drs. Dweck and Blackwell's research, we have found that the beliefs and attitudes held by students when they begin junior high school have a strong influence on their achievement over these critical years.

In particular, the research found that students who believed that their intelligence was something that they could develop and increase—what we term a **growth mindset**—also held many other positive attitudes. First, believing that their ability could be increased, they **valued learning** as a goal, even when it involved hard work or initial errors. They also believed in the **efficacy of effort**—that is, they viewed effort in a positive way and felt that they had the ability, through their own efforts, to learn and master new material up to standard. When they had difficulty in a subject, they made more constructive, **mastery-oriented** explanations—rather than just saying, "I'm not smart enough," or "I just can't do math," they explained their difficulty as due to lack of effort or inadequate strategy. And they responded with more **positive, effort-based strategies** to work harder and spend more time on the subject instead of giving up.

Even more striking, students with a growth mindset had an upward trajectory in mathematics grades over seventh and eighth grade, while those who viewed their intelligence as a fixed quality did not. This was true even though students had equal levels of prior achievement: students who believed that their intelligence was malleable did better than did equally able students who viewed their intelligence as an unchangeable, fixed "entity." This was true for students at all levels of ability (see Figure 8).

Our research, as well as that of others, has shown that students who hold a growth mindset use more sophisticated strategies in their coursework. For example, they use more complex cognitive and meta-cognitive strategies–those that involve active and deeper-level processing of material, and self-monitoring of the learning process.

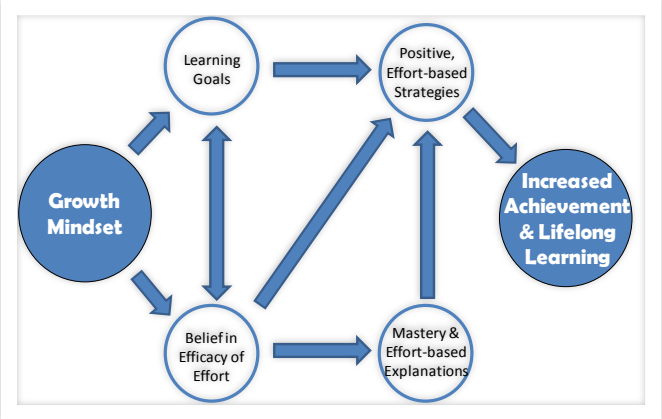

FIGURE 8: HOW BELIEFS AND GOALS PROMOTE ACHIEVEMENT

Research on Learning and the Brain

In the same period of time, research has shown that the brain is in fact much more malleable than previously thought. It was once believed that the brain did not grow new cells, and that there were severe limitations on the malleability, or **neuroplasticity**, of the brain after early childhood. But in the past few decades, research has shown that learning causes substantial changes in the brains of both animals and human beings throughout life.

Thinking occurs in the brain through the chemical communication of nerve cells connected in a complex network. With learning, the cells of the brain develop new connections between them, and existing connections become stronger. Studies in neurophysiology, neuroanatomy, and brain imaging have shown that when people practice and

learn new skills, the areas of the brain responsible for those skills actually become larger and denser with neural tissue, and that new areas of the brain become active when performing related tasks. Furthermore, it has been found that the brain continues to grow new nerve cells, or neurons, daily, and that this process speeds up when a lot of active learning is occurring.

Thus, the brain has the capacity to develop throughout life. However, this development depends on the stimulation of challenge and learning. This fact makes it all the more critical that students be given challenging material and motivated to apply effort and take an active role in learning.

Instructor-Led Intervention Approach: Teaching a Growth Mindset

Would it be possible to improve students' motivation and achievement by teaching them a growth mindset? In a pilot study we did just that by teaching middle school students about what has been learned about the flexibility of the brain to develop and grow new networks with challenge and learning (this was done by an instructor in-person, rather than through software). We then examined changes in the students' motivation and mathematics achievement over the year of the intervention, comparing them with a similar group of students in the same school who did not receive this intervention.

Instructor-Led Pilot Study Results

Gains in motivation: We asked teachers to assess changes in their students' classroom motivation over the period of the intervention. Note that in the pilot study we taught the growth mindset intervention to students outside of their class periods, and teachers did not participate in the intervention. Thus, teachers were unfamiliar with the content of the intervention, and they did not know which of their students had received instruction in the malleable brain. Yet teachers cited significantly more of the students who had received the growth mindset training as showing positive change in their effort and interest in (see Figure 9).

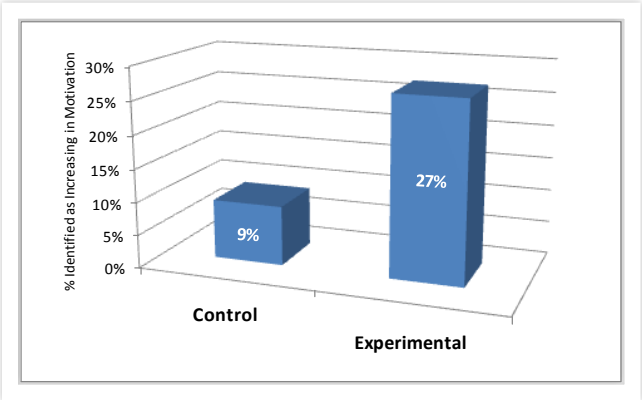

FIGURE 9: TEACHER-RATED CHANGE IN STUDENTS' CLASSROOM MOTIVATION (EFFORT, INTEREST IN LEARNING) FOLLOWING INTERVENTION. (EXPERIMENTAL GROUP WAS TAUGHT LESSON ON MALLEABLE INTELLIGENCE.)

Teacher Comments Following Instructor-Led Intervention

"M. was performing far below grade level. During the past few weeks, she has voluntarily asked for extra help from me during her lunch period in order to improve her test-taking performance. Her grades drastically improved from failing to an 84 on the most-recent exam."

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"Your workshop has already had an effect. L., who never puts in any extra effort and often doesn't turn in homework on time, actually stayed up late working for hours to finish an assignment early so I could review it and give him a chance to revise it. He earned a B+ on the assignment (he had been getting C's and lower)."

"Several students have voluntarily participated in peer tutoring sessions during their lunch periods or after school. These students were passing when they requested the extra help and motivated by the prospect of sheer improvement."

Gains in Math Achievement: The mathematics grades of all students in the study had been declining prior to the intervention. However, after the intervention, the grades of those students who learned about the growth mindset (experimental group) took an upward turn, while those of their fellow students who did not receive this curriculum continued to decline (see Figure 10.)

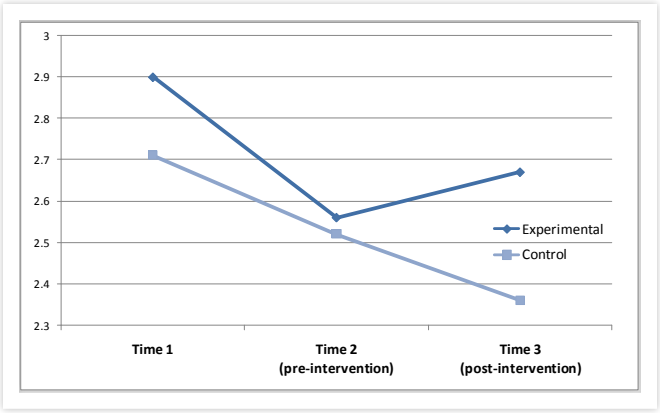

FIGURE 10: MATH GRADE CURVES OVER PERIOD OF THE INTERVENTION (T1=SPRING 6TH, T2=FALL 7TH, T3=SPRING 7TH)

References

Blackwell, L., Trzesniewski, K., & Dweck, C. (2007). Implicit Theories of Intelligence Predict Achievement Across an Adolescent Transition: A Longitudinal Study and an Intervention. *Child Development*, Vol. 78, No. 1, pp. 246-263.

Dweck, C. (2006). *Mindset: The New Psychology of Success*. Random House: New York.

Acknowledgements

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For more information

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We look forward to serving you.