EDUCATION PARTNERSHIPS, INC.

Research Brief

Using brain-based research to help students with special needs

Question: How do students with special needs learn best based on brain research?

Summary of Findings: There was a great deal of strictly scientific information about different types of brain damage and how that can affect learning. Given this, it was surprising that there was very little information on ways in which to assist students with learning disabilities utilizing the scientific information in this field. What was available, related to best teaching practices and was mirrored in the generalized and abundant literature in the field.
Several themes emerged throughout the research. The overarching theme was the role of stress and emotions and their effects on students with learning disabilities. Following closely behind this was the relationship of learning to prior knowledge. The last dealt with the issue of poor readers.

Major Findings and Conclusions:

Stress and Emotions

- Stress occurs when a situation, expected or unexpected, arises that produces a high level of anxiousness. When this happens, first the brain then the body downshifts or shuts down.
- Students with learning disabilities are more prone to stress for several reasons:
  a) their felt need to be like everyone else.
  b) the expectations to be "normal" put on them by themselves and their teachers and parents.
  c) they have fewer copping mechanisms.
  d) they are unable to anticipate the future (i.e. a test, a paper, etc.) so they do not plan for it.
- Often when these students are stressed and feel trapped, they see the stress as a threat, then get more anxiety ridden. They may avoid or refuse to do work, act out, agree to a plan that will never get fulfilled, etc.
- Peptides are receptors in a person's bloodstream. Their primary role is to act as the brain's and body's main communicator and is responsible for 98% of communication. Peptides can either stimulate or slow down the synaptic connections in the brain.
- Information first enters the brain through the brain stem. This is also the part of the brain where a person's survival mechanism is located. If the peptides have communicated to the brain that it is in an unsafe situation, it will downshift and go into survival mode. If the brain is in this mode, it cannot learn.

- When emotions and reactions are positive and the brain feels safe, supported, and/or cared about, learning can take place. The reverse applies. When emotions and reactions are negative and there is a sense of feeling unsafe, unsupported, and/or unwanted, learning cannot and will not take place.

Suggestions:

- Students need to be trained in how to recognize and handle the emotional and physical responses to stress (i.e. sweating palms, racing heart, etc.)
- Students should given ideas and suggestions for how to plan ahead for stressful events.
- Students should be provided with specific strategies to handle unexpected stressors so they do not downshift.
- Teachers need to modify the environment for predictable stress (i.e. preannouncing tests, chunking assignments, etc.)
- Teachers should value and respect the students' strengths and design the class and work around building on strengths while providing opportunities for them to develop their areas of growth.
- Teachers could ask students to evaluate their own work using questions such as, "How did you approach this assignment?" "How does this assignment compare to the last one you did?"
- Teachers should provide an array of projects and assessments where every student has the chance to shine as well as grow.

Prior Knowledge

- The brain is pattern seeking . When new information enters the brain, it searches for familiar patterns and prior knowledge. Once it is located, the information makes an attachment to a neuron that creates an electrical spark, called a synopsis, to another neuron. It is from the synaptic connection that dendrites, the brain's road map of knowledge, are grown.

Suggestions

- Information should be presented in a balanced format meeting as many Gardner's eight multiple intelligences as is appropriate. Then the brain has an excellent chance of growing and lengthening its dendrites.
- A teacher should build from the students' interests and prior knowledge. If so, there will be less of a tendency to downshift.

Poor Readers

- Both sides of the brain communicate with each other through the bridging of the brain's stem. Researchers have found that low reading ability and dyslexia is created by one part of the brain that is unable to process phonemes. Because the brain is complex , other parts of the brain take over to help the person read. Unless the low

reader is specifically trained, the chances are slim that he/she will become any more than an adequate reader.

Suggestions:

- Initially, have the student break down spoken words into phonemes.
- Provide training for the student to take the phonemes from spoken words and put them into print.
- If the steps above are done carefully and methodically, the student should be ready to be trained in phonics.
- Provide ample opportunities, in a supportive and non-threatening environment, to practice developing fluency and comprehension.

Online Resources:

- Active Research Leads to Active Classrooms
  One of the criticisms of brain-based research is that is being conducted by neuroscientists who are not in the classroom and do not know what information educators need. This article describes a research project conducted in Salt Lake City, Utah, where teachers and neuroscientists teamed in order to better and accurately determine in what areas and sequences students were really learning.
  http://www.help4teachers.com/activeresearch.htm

- Advantages to Layered Curriculum
  Teachers working with students to establish specific expectations and giving students choice in their assignments is described.
  http://www.help4teachers.com/whyy.htm

- A Relationship to be Concerned About: Stress and Students with Learning Disabilities
  This article describes the stress reactions of students who have learning disabilities. It provides suggestions on how the teacher can help these students plan for and productively cope with stress.
  http://www.lesley.edu/learninglab/articles.html

- Brain Biology: Basic Gardening
  The concept of the pruning process that goes on in an adolescent's brain and the importance of sleep to learning are described and discussed.
  http://www.help4teachers.com/gardening.htm

- Children's Reading Disability Attributed to Brain Impairment
  A summary of research about the lack of phonemic awareness in students who have low reading abilities and ways the brain takes over to help them compensate.
  http://www.nichd.nih.gov/new/releases/disability.cfm

EDUCATION PARTNERSHIPS, INC.

- Multiple Intelligences and Underachievement. Lessons from Individuals with Learning Disabilities
  This article describes research that concluded that intelligence quotients and imagination are not mutually exclusive. It explains how one builds knowledge based on prior experiences and interests. There are many suggestions for the educator on ways in which to reach students with special needs.
  http://www.ldonline.org/ld_indepth/abilities/multiple_intelligences.html

- Pugh, K., et al (2001). Neurobiological studies of reading and reading disability. 34, 479-492. Go to the the Table of Contents and Abstracts window.
  A highly detailed and scientific article regarding research on people with reading disabilities and those with no reading disabilities.
  http://www.elsevier.com/

Articles:

- Caine, R. N. (2000, November) Building the bridge from research to classroom. *Educational Leadership,* 58, (3*).*
  This article describes what happens to the brain and learning, when downshifting occurs.

- Caulfield, J., Kidd, S., and Kocher, T. (2000, November). Brain-based instruction in action. *Educational Leadership* 58 (3), 62-65.
  Emotions have a direct effect on learning. A description of what happens when the brain feels threatened and some ideas on ways to handle this are addressed.

- Given, B. (2000, November). Theaters of the mind. *Educational Leadership* 58 (3).
  A description of how the brain is on and taking in information, 24-7 is provided. It has strong implications for educators on the types of learning students are expected to do and can actually do, based on brain-based research.

- Greenleaf, R. K. (1999, September). It's never too late! What neuroscience has to offer high schools. *NASSP Bulletin*, 80-89.
  The role of emotions, movement, and methods of presentation are tied into brain-based research. There are several suggestions for ways in which to work with students utilizing the research.

- Tomlinson, C. A., and Kalbfleisch, M. L. (1998, November). Teach me, teach my brain. A call for differentiated classrooms. *Educational Leadership* 56(3), 52-55.
  Why classrooms need to be a safe place to take risks and building on prior knowledge in order for the brain to grow is described.

- Wolfe, P. (1998, November). Revisiting effective teaching. *Educational Leadership*, 56, (3).
  Brain-based research is compared to Madaline Hunter's Elements of Effective Instruction, and how it is still important and valid.

Books:

- Given, B. (2002). *Teaching to the brain's natural learning systems*. ASCD: Alexandria, VA.
  This book provides an overview of how the brain is structured. It covers the brain's systems of emotions, social, cognitive, physical, and reflective learning. It does provide applications of the ideas into the classroom.

- Jensen, E. (1998). *Introduction to brain-compatible learning*. The Brain Store, Inc.: San Diego, CA.
  The author is one of the foremost authorities in this field. This book is easily understandable. It explains

  brain-compatible learning, applications of the information to learning and the environment, and how to use the information in the classroom.

- Sprenger, M. B. (2002) *Becoming a wiz at brain-based teaching*. Corwin Press: Thousand Oaks, CA
  An analogy is used to connect brain learning to the Wizard of Oz. It provides an overview of the physical structure of the brain, how the brain deals with stress, emotions, cognitive skills, and the learning environment.

- Tomlinson, C. A. (1995). How do differentiate instruction in mixed ability classrooms. ASCD: Alexandria, VA.
  According to this book there are two common characteristics in effective classrooms: every student is an active participant in their own learning, and all students are actively engaged in their own decision-making. There are many ideas on ways in which to reach every student in the classroom.

- Wolfe, P. (2001) *Brain matters*. ASCD: Alexandria, VA.
  This book is for those who would like more advanced information on the structure and function of the brain. The implementation section provides practical suggestions and projects for the classroom.

Submitted By: Dr. Karen Walker, University of Maine, Farmington