

Building a Brain Health Environment in the School

Dr. Paul D. Nussbaum, Keynote Speaker



**International Center
for Leadership in Education**

1587 Route 146 • Rexford, New York 12148 • (518) 399-2776 • fax (518) 399-7607 • www.LeaderEd.com

Building a Brain Health Environment in the School

Paul D. Nussbaum, Ph.D.

June 2009

There is a great scene in the movie *BraveHeart* where William Wallace, played by Mel Gibson, addresses the troops prior to a battle with the English army. After he delivers his moving call to arms he returns to the ranks and his fellow soldier looks at him and says “Nice speech, now what do we do?”

Similarly, audiences who listen to my keynote on brain health typically wish to apply the content of the message to their own lives and to their organizations ask “Now what do we do?” Certainly, there are lifestyle changes an individual can make to begin his or her personal journey to a healthier brain, though behavior change is hard and should not be undervalued. However, how can the culture of a school be transformed into a brain health center or environment? The following describes a blueprint for the development of a brain health setting that provides the necessary enriched environment filled with the novel and complex. It attempts to answer the question, “Now what do we do?”

Step 1: Basics of the Brain and how Brain Health Works

Regardless of the setting (school, work, home, library, business, corporate), the first step that must occur with transformation to brain health is both conceptual and informational. Leadership at the setting must establish a commitment to change the existing culture to one that understands and applies brain health on a daily basis (conceptual). There needs to be a belief that persons within the environment can engage in and benefit from activities and a general lifestyle that promotes brain health. It is important to underscore the need for strong leadership when shifting to a brain health culture. The transition plan should be communicated by leadership to the entire staff prior to the next phase of step one, which is education (informational).

Each person within the environment needs to be educated on the basics of the human brain in a fun, friendly, and personal way. Most people have never taken the time to learn even the basics of the brain. This is despite the fact the brain is the most complicated, miraculous, and impressive system in the body! Everyone can learn the basics of the brain, and I have found that most people are excited and deeply interested to do so. They become “brain health ambassadors.”

The teaching of the basics of the human brain can be done using many methods including use of coloring books, cartoons, books, DVDs, live lectures, courses, and even documentaries (see www.paulnussbaum.com). For those interested in transforming a setting to brain health, you may promote your work with community oriented “shows” on the brain in which a person dedicated to teaching about the brain provides a lecture on the brain that is fun, personal, and informative. This should be done in the context of a show with music and food. The school can capitalize on such a show by advertising itself as the setting where the brain can be shaped for health.

I have had the pleasure of working with many diverse organizations and sectors of society interested in brain health. From the corporate setting to libraries, schools, health care settings and even the home, I work with the leadership to build a strategic plan that will inform and apply brain health as part of the culture change (e.g., existing employees and new hire orientation). I enjoy educating people in their environment on the basics of the human brain and teaching them about my brain health lifestyle (see www.paulnussbaum.com). This is typically done with in-service activity, DVDs, books, and self-report surveys on the human brain and personal lifestyles. Once the leadership and core staff are comfortable with the basics of the human brain and with the lifestyle that can help to shape a healthy brain, a plan for action can be developed and implemented that leads to a brain healthy culture.

For every entity that is interested in creating a brain healthy culture distinct individuals emerge who are quite eager to learn and lead the movement to brain health. I refer to these persons as “brain health ambassadors” and they become the core staff within the existing environment to foster and

promote the change. Working closely with the brain health ambassadors, I can help to keep a strategic focus and direction for the team as the culture takes small, but persistent steps towards brain health.

Step 2: Understanding the Brain Health Lifestyle

My brain health lifestyle (Nussbaum, 2007) is easily understood, research-based, and easily applied for the individual and group setting. Aspects of the lifestyle have already been applied to corporations, schools, libraries, and health care settings (see www.paulnussbaum.com for pilot study on memory benefit from following the brain health lifestyle). The brain health lifestyle incorporates five distinct, but integrated components: (1) physical activity, (2) mental stimulation, (3) socialization, (4) nutrition, and (5) spirituality. Each of these components or “slices to the brain health pie” have documented, research-based activities (see Nussbaum 2003, Nussbaum, 2007) to reduce the risk of dementia or to foster brain health. Together, these activities within each of the brain health slices define the brain health lifestyle that can be applied in a culture committed to change.

The following offers the basic research-based activities for each of the five slices to the brain health lifestyle:

Physical Activity

Physical activity relates to brain health because 25% of the blood, oxygen, and glucose from each heartbeat goes directly to the human brain. While the human brain weighs only 2 to 4 pounds on average it demands more from each heartbeat than any other part of the body! It truly is the “central” nervous system. Knowing this simple fact, we can better appreciate the reason why physical activity promotes brain health. Specific physical activities that promote brain health include:

1. Walking about 10,000 steps daily or 30 minutes a day
2. Gardening
3. Aerobic exercise three times a week
4. Knitting
5. Dancing

Mental Stimulation

Animal studies have demonstrated neurogenesis (new brain cell development) for rodents exposed to enriched environments that include novel and complex stimuli. Human neurogenesis was demonstrated in a publication in 1998 with the neuroanatomical structure critical to learning, the hippocampus, representing the site of neurogenesis in both animals and humans. This supports the idea that the hippocampus and the role of learning are fundamental to our neural health and that our brains have the agility and adaptation to respond favorably to healthy stimuli. Environments that provide novel and complex stimuli are those most likely to be deemed “enriched” with the greatest likelihood of promoting brain reserve. *Brain reserve* refers to the development of increased cellular connections (synapse) that help to defend against or delay the onset of neurodegenerative diseases such as Alzheimer’s disease (AD).

A critical issue for everyone to remember is that the most sophisticated system for thinking, creating, problem solving, and basic academics is the human brain. It is critical for our society to turn inward for solving problems rather than relying only on gadgets or devices to do the work!

Research on the role of mental stimulation suggests the following are some of the activities help to reduce the risk of dementia:

1. Reading and writing on a daily basis
2. Learning a second language
3. Learning sign language even prior to baby’s ability to speak orally

4. Activities that increase IQ early in life, such as good nutrition, breast feeding, sign language, mental stimulation, safe and loving environment, and touch
5. Travel
6. Learning a musical instrument
7. Listening to classical music
8. Using computerized brain exercise software (see www.Fitbrains.com)

Nutrition

We have learned that the foods we consume affect our bodies and brains. Food has the ability to alter thought processes, mood, and behavior. There is a new field of study called “nutritional neurosciences” that recognizes the impact of food on the function of the human brain. We also know that the human brain is comprised of 60% fat; indeed the brain is the fattest part of the body. It is believed that the lipid or fatty substance of the brain helps to insulate neural tracts propelling information in a rapid and efficient manner. A brain that loses fat displays slowed information processing.

In recognition of this fact and our better understanding of the role of “free radicals” that originate as cellular breakdown with oxygen serving as a major catalyst, we can propose specific foods that supplement omega-3 fatty acids (good fat for the brain) and antioxidants that combat free radicals.

Here are some suggestions for your Brain Health Diet:

1. Increase your salmon intake to every week.
2. Consider adding mackerel, herring, and sardines.
3. Eat unsalted nuts and walnuts.
4. Increase the fruits and vegetables.
5. Eat with utensils and you will eat less and healthier.
6. Drink fruit juices, particularly grape juice.
7. One 4 to 6 ounce glass of red wine daily (for those not predisposed to cancer or alcoholism).
8. Use canola oil and olive oil when cooking.
9. Remove the fast foods.

Socialization

Research for both animals and humans indicates socialization is important to health and to reducing the risk of dementia. It is important, therefore, to remain integrated in the community, to build a growing network of family and friends, and to always have a role and purpose for getting up each day. Retirement, as a national policy, does not make sense for a nation that prioritizes brain health for its citizens. Retirement can promote isolation and passivity, which reduce the likelihood of building brain reserve and drives a brain towards disease.

1. Identify your reason for being alive and then follow it.
2. Work on building new relationships and reinforce existing ones.
3. Work to resolve existing conflicts with others.
4. Develop hobbies to build new interests and build brain reserve.
5. Remain active in pursuits that are meaningful to you.
6. Do not retire from life; maintain a role and a purpose.
7. Work on removing loneliness from your life.
8. Eat one meal a day with family-friend.

Spirituality

Research indicates that animals exposed to environments that are too stimulating experience slowed brain development. Our own pace in life tends to be rapid and probably unhealthy. While most of

us realize that we are going too fast and that we are involved in too many activities simultaneously, we have a hard time knowing how to slow down.

The brain demands stimulation, but it also can function best when it has rhythm and symmetry. Our hectic pace raises the probability of mental chaos, stress, and reduced cognitive efficiency. It also can lead to emotional breakdown. A brain health environment supports time for oneself, time to slow down, and time to keep the brain energized. I refer to this generally as spirituality. Of interest is the fact that an entire new field of study called *neurotheology* has emerged to study the relationship between spirituality, religion, and the brain.

To help “slow down” the following may be considered:

1. Get enough sleep at night (6-8 hours and more for younger children).
2. Learn relaxation procedures that include breathing with rhythm and progressive muscle relaxation.
3. Learn how to turn inward through meditation and yoga.
4. Use prayer on a daily basis.
5. Attend a place of formalized religious practice on a regular basis.
6. Reduce the number of volunteer obligations on your list.
7. Give yourself 30 minutes a day for “your time.”
8. Help your children to engage in one activity at a time.

Step 3. Implementing Brain Health into Your Environment

Aesthetics and the Brain Health Environment

Regardless of what environment is being transformed towards brain health it is important to consider what one might experience when coming close to and entering the brain health setting. How does a school, library, business, home, or other setting alter its current appearance/function let everyone know that brain health is a priority?

Some recommendations include:

1. Place a brain health flag in front of the building or some signage that conveys the priority of brain health to all who approach.
2. Display illustrations of the brain, with easy to read and understand basics on the brain, inside the front entrance.
3. Highlight brain health tips throughout the entry and entire facility. Create a well-identified area (Brain Health Kiosk) for information on the brain and brain health, perhaps a short DVD of such material, resource information, computerized brain health survey to derive one’s brain health weaknesses and strengths (Nussbaum, 2007), and help in developing a proactive brain health lifestyle.
4. Change the names of existing departments or areas to be consistent with the five slices of the brain health lifestyle.
5. Place large informational signs and illustrations of brain healthy food in the cafeteria and lounge.
6. Use small brain icons to depict what foods are brain healthy for the consumer, staff, and student.
7. Create a brain health walking path around the building or setting and get a sponsor to provide pedometers.
8. Give the title “brain health ambassadors” to those who demonstrate knowledge and application of brain health in the setting. Perhaps give them a pin and other reward to recognize their commitment and dedication to promoting brain health.
9. Provide a packet of information on the basics of the human brain and the lifestyle to promote brain health for all visitors to the setting.

10. Implement an orientation program for new hires and existing staff to help make brain health part of the culture.

School

The school represents a natural setting for transformation into a brain health center. I have written about the school building as a brain health center in the past (see *Education in America* at www.paulnussbaum.com) and that learning should be viewed as a health promoting behavior with both short-term and long-term effects (see *Learning Vaccine* at www.paulnussbaum.com). Teachers, in many ways, represent health care providers as they are on the front line helping to shape the brains of our youth through proper listening and teaching. In this model, curriculum is no different from a chemical that is consumed by the body to the brain with predictable outcomes. The major issue is to select proper curriculum within an enriched environment (rely on the novel and complex) to shape the brain for short-term learning and for long-term health outcomes that include building brain reserve that helps to delay the onset of neurodegenerative diseases such as Alzheimer's disease (AD). I recently published a book with Dr. Willard Daggett (2008) that relates brain health directly to how the brain processes and interfaces with rigor, relevance, and relationships: the model of learning espoused by the International Center for Leadership in Education (www.leadered.com).

After a school's administration and staff decide to transform the environment of the school setting to a brain health center Step 1 and Step 2 will need to be completed and reinforced with a continuous process to become an expected part of the culture itself. From there, Step 3 can begin with implementation of structural changes and visual reminders in the environment that both underscore and reinforce the environment as promoting brain health. The second part of Step 3 is to implement the research-based activities from each of the five different slices of the brain health lifestyle into the daily life of those living and working in the setting. The following suggestions are broken down by each slice of the brain health lifestyle and are meant to stimulate creative thinking for people in the settings discussed.

School and Physical Activity

Physical activity needs to be considered from both a brain health and learning perspective within the education system. If one reconceptualizes the brick and mortar of a school to a brain health center, the structural and programmatic aspects of the school building can be reviewed and in some cases changed. Regarding physical activity the most obvious examples are recess, gym class, or physical education curriculum that involve some aspect of movement and exercise. Studies suggest that physical exercise relates to enhanced learning and perhaps even better test scores. With some creativity, schools and the entire education system can consider and implement learning with physical action. This stands in stark contrast to our current education model that involves very little movement, with teachers standing in front of students and students sitting in chairs within a confined space known as the classroom!

Consider the following for physical activity and the school system:

1. Students recite learned information or express creative ideas while walking or jogging around a track. Could headsets be used while a student is jogging or walking? Can a teacher be in the press box using the audiosystem to ask the questions on a test? Can we use existing technologies to make this happen?
2. Students use computerized mental fitness software (see www.fitbrains.com) while walking on a treadmill or using a stationary bike.
3. Physical activities such as gardening, knitting, and ballroom dance are incorporated with learning of new information across different subjects.
4. Every student, teacher, and employee of the school or school district can wear a pedometer to demonstrate the commitment to walking for brain health. Friendly competition can be generated

by having one class compete against another class or one department of teachers against another in number of steps taken for the month.

School and Mental Stimulation

An enriched environment in a school setting means using stimuli that is novel and complex. When we are exposed and engaged with stimuli that is novel and complex we utilize our cortex, the area of the brain where brain reserve occurs. As such, learning new and difficult information provides a short-term benefit that includes enhanced intelligence. Perhaps more importantly, however, a long-term benefit is also derived in which the brain builds brain reserve that can help to delay the onset of neurodegenerative diseases such as Alzheimer's disease. The very function of learning today therefore is health promoting with the greatest positive effect taking place many years later! This is the precise reason I believe learning should be part of our health care plan and encouraged by the major health care payer systems such as Medicare and others.

Underlying this philosophy is the belief that the human brain is the system we all need to stimulate and to challenge. It is the brain that can solve problems most efficiently and literally create the gadgets and devices that we may think are so impressive. A recent study found that 3rd graders do better with mathematics when they use their brains first to learn and solve calculations before turning to calculators. It is not the other way around and this reinforces my deep belief of our need to turn to our own brains for innovation and creativity, rather than to computers, iPods, cell phones, etc.

How does a school as an enriched environment promote mental stimulation with novel and complex stimuli? Creativity and innovation are two critical thought processes to promote in the school setting interested in brain health. Einstein often asserted that a less structured environment best unleashes the imagination and creativity of the brain. Unfortunately, our school environments tend to adhere to a highly structured and programmatic approach to education.

A school building or system interested in transitioning to a brain health center may consider the following to promote mental stimulation:

1. Consider setting the chairs of the classroom in a circle or several small circles rather than rows and columns. This can engage the students rather than all eyes and ears on the teacher.
2. Consider curriculum that is open ended and demands the student's brain to create and imagine (the less structure the better). The brain will project its ideas onto the stimulus. Our current methodology seeks specific fact-based answers to specific questions and does not provide much room for the student to analyze, problem solve, or create.
3. Enhance debate and critical thought that is free from grading. Encourage student input on real world events. Promote student problem solving regarding issues that the nation and world confronts.
4. Ask students and teachers to develop a self-profile of talents and weaknesses. The novel and complex stimuli can be generated from the weaknesses. It is in areas of cognitive or intellectual weakness that the most brain reserve can be generated. We will also use our cortex when we engage in new or unfamiliar activities. The time we spend on our intellectual strengths taps our subcortex, results in production of far less brain reserve, and keeps us in a passive and rote process. The latter is relatively unhealthy for the brain.
5. Reward students for learning a second or third language.
6. Incorporate American Sign Language into the curriculum at the earliest of ages as even infants can learn sign language. Sign language increases the intelligent quotient (IQ) and an increased IQ early in life reduces the risk of AD later in life!
7. Educate the students why travel to new (and therefore complex) environments taps the cortex, develops brain reserve, and promotes brain health.
8. Encourage applied learning of one or more musical instruments and discussion and debate on different types of music.

9. Make time for creative artwork where students are free to discuss feelings and interpretation of the art they create.
10. Encourage hand writing with prose that is passionate as this has been related to longevity. The writing should be personal in nature and students can describe the process and the meaning of what they write.
11. Develop challenges for students to create and define opportunities that will promote creativity and imagination.
12. Challenge students to develop methods of learning that incorporate their primary means of communication which typically includes cell phones, iPods, and computers.
13. Partner students with professionals in the community to provide opportunities to problem solve and apply classroom lessons to the real world. Apply new information to an unpredictable challenge or problem.
14. Consider and encourage teaching and learning with multiple sensory systems as the brain is pleased with multiple and simultaneous stimuli. Our educational system tends to rely primarily on visual and auditory sensory systems.
15. Emphasize the arts, drama, music, and self-expression that tap our nondominant hemisphere and counters our tendency to overly focus on the dominant or verbal side of the brain. Promote all five sensory pathways to learning.
16. Integrate and merge different bodies of knowledge, academic and applied, to form an entirely new intellectual or tangible entity (intellectual alloy). This is perhaps most important from the perspective of brain health. Our education system tends to operate in silos, both by discipline and structure. We can enhance brain health and promote creativity, imagination, and innovation by breaking down silos and merging the content within the silos. For example, how can music integrate with math or physical education with English?

From the rigor, relevance, and relationships perspective of learning (see www.LeaderEd.com), Quadrant D represents the highest level of information complexity that is applied in unpredictable ways. From the brain perspective, Quadrant D is most likely the domain of the frontal lobe. Interestingly, and not coincidentally, the frontal lobe is a primary region where creativity, imagination, and application of multiple pathways of integrated information occur. As such, the frontal lobe is the ultimate site of nourishment from an enriched environment that promotes the novel and complex within a school building!

This is a significant difference from our current tendency to teach and learn using rote processes with little room for critical thought or creativity, single or two sensory systems, highly verbal based stimuli, and with far too much structure imposed on the brain.

School and Nutrition

We have become what we eat with literal changes in our DNA and genetic makeup over time. Interestingly, from a brain health perspective we were really never meant to eat meat, cheese, eggs, milk and certainly not the processed foods that were invented with the industrial age. We really are supposed to eat lean game, fruit, vegetables, fish, nuts, beans, and sticks. We really have changed our dietary habits from our days as cave men and women. Along the way we have incurred the consequences of such dietary change in the form of heart disease, diabetes, obesity, stroke, and probably many other serious diseases.

A school that prioritizes brain health will realize the critical importance of the types of foods in the culture. The cafeteria, lounge, and vending areas become a focus for change towards brain health. Display of information on brain health foods is important to all who enter and travel throughout the school. Consider the following:

1. Create large and colorful displays of the human brain in the cafeteria, lounge, and vending areas of the school. Illustrate the basic parts of the brain including the hippocampus, which is a primary site for learning. Provide information in writing that the brain is composed of 60% fat that helps to insulate nerve tracts and propel information rapidly. This provides an easy transition to the “good fats” we should consume if we are interested in brain health.
2. Promote foods such as fish (salmon, herring, mackerel, tuna, and sardines), fruits, vegetables, nuts (unsalted and walnuts), lean chicken without skin, juices.
3. Label brain health foods in the school with small brain icons to educate the consumer on what foods promote brain health.
4. Include brain healthy foods in all vending machines.
5. Provide brain healthy foods in the lounge.
6. Encourage students to develop methods and then apply ideas to teaching the student body and staff about brain health nutrition.
7. Create curriculum and assignments that have the students apply what is learned from nutrition and the brain. One school in Texas had students create a brain health cookbook.
8. Consider starting the school day later to permit all students to get a nutritional breakfast as this can help with learning.

School and Spirituality

A discussion on themes of spirituality and religion with our education system is a sensitive topic. However, it is important to acknowledge that we are all spiritual beings with a long history of human experience entrenched in our DNA. The issue for this section is how to use a broad array of spiritual experience to enhance learning and to foster brain health environments.

Research is clear that stress has an adverse effect on our general health and specifically on our ability to learn. Animal studies and some human studies indicate chronic stress relates to structural changes in the hippocampus (the structure critical for memory and learning) and that memory impairment results when an organism is confronted with chronic stress. Animal research also indicates that environments with too much stimulation slow or even stop brain development. It is probably fair to suggest that our society is fast moving, perhaps too fast. The implications of such a fast-paced society are most likely real, but have not yet been fully recognized or discussed. Consider the following for expression of spirituality within the school setting:

1. Implement two five to ten minute periods a day when the entire population of the school will stop and engage in breathing exercises.
2. Provide ongoing meditation classes for students and staff to learn and use in their lives. This can include visualization techniques for success.
3. Provide information on the relationship between such stress reduction techniques and health, learning, and longevity. Students can apply such techniques prior and during test taking sessions or extracurricular events.
4. Try to measure the impact of relaxation and visualization techniques on test scores and student perceptions of their ability to learn.
5. Encourage everyone to prioritize time for themselves during the busy day. Thirty minutes a day is recommended.
6. As rest is critical to the brain and the developing brain, serious consideration should be given to the school schedule with greater flexibility as to when school takes place. Focus should be on providing students the opportunity to get enough sleep during the night. This might mean a need to start school later in the day, create opportunity for night class, and even consider weekend class work. The implementation of the virtual classroom with teaching and learning from a portal to home (or online learning) can help with this goal.

School and Socialization

This particular part of the brain health lifestyle might seem obvious and easy to integrate into a brain health center (school). Certainly there is ample opportunity for socialization within the hallways and classrooms of schools. Even extracurricular activities tend to be group oriented and the cafeteria also offers a wonderful opportunity for human connection. The important shift that needs to occur for brain health in the school is to make socialization first understood as a health promoting behavior and then to create opportunity for critical thought and expression of thought and feeling during these times. These moments foster the creativity and innovation that results from integration of different viewpoints and perspectives. Consider the following ideas for socialization and brain health in the school:

1. Create small groups within the larger classroom to review, critique, analyze, problem solve, and create plans of action on particular unknown topics of the day.
2. Incorporate lunchtime into an opportunity for fun debate, oral presentations, musical presentation, and drama. Permit groups to present their ideas and creations to a larger assembly during the lunch period.
3. Encourage students to form committees to develop strategic plans on use of technology and curriculum development. Issues such as “learning in our world” can be championed by the students with results implemented into the culture of the school.
4. Create and design opportunities for groups of students and teachers to merge their activities and knowledge bases. For example, can the activities of gym class be integrated with math or shop? Can English or the arts be part of lunch time? Can dance and relaxation take place prior to test sessions? Can there be an entire curriculum dedicated to innovation and creativity using small or medium sized groups of students?

Summary

This white paper has outlined practical suggestions on how to implement brain health into an existing setting such as the school. These ideas are meant to answer the question “Now what do we do?” The fascinating fact about brain health is that we already have settings designed to promote brain health, we simply need to reorient our approach and use of such settings. Research tells us that an environment that is enriched and provides novel and complex stimuli increases our potential for brain health by building brain reserve. The brain reserve is thought to help delay the onset of neurodegenerative diseases such as AD. This helps to underscore the importance of a proactive and lifelong pursuit of brain health as we all want to maintain our memories and life story.

I have proposed implementation of brain health into existing settings by first establishing brain health as a priority and desired cultural shift. Once this is established, physical changes can occur outside and inside the setting that illustrate that setting’s commitment to brain health. Finally, the substance of brain health is implemented using my brain health lifestyle. The five major components of the lifestyle – physical activity, mental stimulation, nutrition, spirituality, and socialization – have specific research based items that promote brain health and can be applied to the particular setting.

This paper provides a blueprint to follow for those intent on bringing brain health to their setting and changing their existing culture. Brain health is a critically important and interesting frontier that has captured the focus of the nation. It is now up to those of us on the front lines of schools to introduce and implement brain health. Everyone who works to learn about the brain and to make lifestyle changes to promote their own brain health will benefit. While change is typically not easy, such lifestyle alterations can be fun and personally relevant. It is time for all of us to begin a proactive approach to protecting our life stories so that we can share them with our next great generation of little ones.

Good luck with the transformation to brain health!

Resources

www.paulnussbaum.com (books, DVDs and other information on the human brain)

www.fitbrains.com (software program for mental exercise)

www.leadered.com (for book and DVD by Dr. Nussbaum)

www.asaging.org

Nussbaum, P.D. (2003). *Brain Health and Wellness*. Word Association Publishing, Tarentum, Pa.

Nussbaum, P.D. (2007). *Your Brain Health Lifestyle*. Word Association Publishing, Tarentum, Pa.

Nussbaum, P.D. and Daggett, W. R. (2008). *What Brain Research Teaches about Rigor, Relevance, and Relationships and What It Teaches About Keeping Your Own Brain Healthy*. International Center for Leadership in Education, Rexford, NY.

Nussbaum, P.D. (2009). *Your Brain Health Lifestyle: Application to the School, Library, Corporate and Business Setting and Home*. Word Association Publishing, Tarentum, Pa.

Dr. Paul D. Nussbaum is a Keynote Speaker for the International Center for Leadership in Education and Clinical Neuropsychologist and Adjunct Associate Professor, University of Pittsburgh School of Medicine.

International Center for Leadership in Education
1587 Route 146 • Rexford, NY 12148
(518) 399-2776 • fax 399-7607

www.LeaderEd.com • Karen@leadered.com

drnuss@zoominternet.net