# Why does Neuroscience Belong in Classroom Practice?

> "…(Teachers)… work in a laboratory called the classroom, and we have a tremendous amount of knowledge and understanding of the teaching/learning process. We have gained this knowledge through experience and from research in educational psychology, cognitive psychology, and teaching methodology. It is up to us to decide how the research from all these sources (and now from neuroscience) best informs our practice."
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> Pat Wolfe, Ed. D. (2010, p. xii)

For the last three decades, Dr. Patricia Wolfe author of ***Brain Matters 2nd Edition*** (ASCD, 2010) and ***Building the Reading Brain, PreK-3 2nd Edition*** (Corwin Press, 2009), has been a crusader for getting teachers to understand the importance of studying neuroscience and translating it into classroom practice. Being a personal mentor of mine, our group, The Brainy Bunch, which meet yearly with her to discuss what is currently happening in the field of neuroscience and its implications on teaching and learning. I've been a part of this group of educators for number of years and it never ceases to amaze us that as we work with a vast array of educational institutions, we are astounded at how very little our teachers really understand the brain and how we learn.

**What is neuroscience? What is Cognitive Neuroscience?**

Neuroscience is the study of the brain and the nervous system. Cognitive Neuroscience is "..a branch of neuroscience concerned with the biological processes of the nervous system which form the basis of cognitive functioning" (Merriam-Webster). It's our thinking, remembering, reasoning, decision-making -- how the brain learns, retrieves and applies information-- everything involving conscious intellectual activity.

Our brain is constantly changing and everything that we do physically changes it. Our brains are considered "plastic." This allows us to change and mold our brains as our environment changes and dictates how our memories are used in the future. This is called neuroplasticity and as educators, we need to realize that we (as well as the students themselves) actually have the ability to physically change their brains – and their intelligence. The brain becomes what it does. Understanding the brain and how it works is critical for our educators to become high-impact, effective teachers.

To have a student in a class with a teacher who really doesn't understand the implications of brain-changing neuroplasticity, is like sending your car in for repair to a mechanic who doesn't understand how the engine works.

"There is nothing more human than the human brain," said Bill Latham, CEO of MeTEOR Education and author of Humanizing the Education Machine. Educators study childhood development and now as the field of neuroscience expands, why wouldn't

educators grasp the opportunity to explore this incredible depth of knowledge to enhance their practice and daily interactions with their students?

When the senses are stimulated, the brain turns that data into information. As the neurons (the basic cell of the brain) get activated, neuroplasticity allows for new neural pathways to be formed. This encoding process requires activation of prior knowledge. "Neuroimaging research supported by cognitive testing reveals that the most successful construction of working (short-term) memory takes place when there has been activation of the brain's prior knowledge before the new information is taught" (Willis, 2012).

John Hattie's research of over 50,000 studies, echoes the same idea. Deep learning builds on the student's prior knowledge and that knowledge base provides the foundation needed for deeper understanding and transference (Hattie, 2017). By making teachers aware of how the brain works, -- that the brain seeks patterns, connections and relationships between the new learning and prior knowledge, the teacher then understands why the use of cross curricular studies, graphic organizers, spiraled curriculum, etc., increases encoding in the brain (Willis, 2012).

**Advantages of Studying Neurological Research**

**1. Validating Strategies**

When working with teachers I have found they all have their favorites teaching strategies and methods – the ones that work and provide the best results. When we look at various research in neuroscience, it affirms their beliefs about what makes for good educational practice. Now we have the research that supports what effective teachers have known all along. By studying research, teachers will also be able to distinguish those practices that are least effective.

2. **Better Understanding of Students with Learning Disabilities and Learning Problems**

Neuroscience research makes it easier to identify students with learning disabilities and to provide interventions that can significantly help students with their academic performance. Understanding that Asperger's syndrome, for example, as a neurological disorder helps teachers comprehend why the student acts the way he/she does, and what teaching strategies still work best. New biomarkers and diagnostic strategies for disabilities for ADHD and dyslexia have been identified, leading to more successful early intervention actions (techthought).

Understanding that every brain is unique and processes information differently, helps teachers maintain a perspective while working with a variety of learners who are having difficulty in their learning process. Educators also tend to be more supportive when their students' behavior is not necessarily entirely under their voluntary control. That helps understand students allowing them to have more patience and understanding. By

being aware of the slow development of the prefrontal cortex, for example, enables educators to be more persevering with students (Hook, 2012). Identifying executive functioning difficulties enables even experienced teachers to have tolerance – especially those working with the adolescent brain!

3. **Learn How to Use Technology More Effectively**

The use of technology and computers are changing our brains – good or bad – it's happening and computers are here to stay. So educators need to get a handle on this beast. We've gone from main frame computers, to personal computers, to the internet to smartphones. Most children are computer-literate and many are more advanced than their teachers. Computers and the use of technology are changing formal education and not only do teachers need to keep their own personal skills sharp, they need to learn to use technology to their advantage when working with students. Computers, iPads, video games, smartphones, as well as the media and advertising, are rewiring our brains. (Lin, 2008).

4. **Use Research to Improve Teaching and Learning**

Effective teachers are always trying to enhance their skills, thus improving student achievement. Teachers need to understand what the most effective teaching strategies and methods are (Best Practices), as well as how to implement them. But they also need understand why they are the most effective. That's where the study of neuroscience comes in.

5. **Being Able to Translate Research into Classroom Practice**

John Bruer's book, The Myth of the First Three Years: A New Understanding of Early Brain Development and Lifelong Learning (1999, Free Press) argues that because educators' have a lack of understanding brain research, there has been "misapplications of cognitive neuroscience discoveries" (Sylwester, 2001).

To maintain our credibility with the scientific world, teachers must distinguish trendy "research-based" claims about the brain from those grounded in legitimate neuroscientific findings. And then we need to figure out how to translate that information into classroom practice.

"The most valuable assets for improving education won't be developed in a neuroimaging laboratory. It will be educators, the foundational knowledge about the science of learning, who will be prepared to evaluate the validity and potential educational correlations from neuroscience research" (Ansari, 2014).

**Action Steps:**

- Read books by educators as well as neuroscientists themselves.

- Wolfe, P. (2010). Mind Matters, 2nd Edition. Translating research into classroom practice. Alexander, VA: ASCD.

- Sylwester, R. (2000). A biological brain in a cultural classroom: Applying biological research to classroom management. Thousand Oaks, CA: Corwin Press.
- Sylwester, R. (2005). How to explain the brain. Thousand Oaks, CA: Corwin Press.
- Diamond, M., & & Hopson, J. (1999). Magic Trees of the Mind. New York, NY: Penguin.
- Glick, M. (2011). The instructional leader and the brain. Thousand Oaks, CA: Corwin.


- Search the Internet paying particular attention to scientific journals, educational webpages focusing on neuroscience, neuroeducation, Brain-Based Education, etc. Get familiar with neuroscientists and educators who are well known in their field for their involvement with neuroeducation. Also check such research based webpages like edutopia (www.edutopia.org) and TED Talks (https://www.ted.com/talks).
- Join professional organizations.
  - Neuroscience & the Classroom: Making the Connections https://www.learner.org/courses/neuroscience/
  - The Dana Foundation http://www.dana.org/educators/
  - The Society of Neuroscience https://www.sfn.org/public-outreach/education-programs/resources-for-educators
  - International Youth Neuroscience Association https://youthneuro.org/
- Attend seminars and conferences such as Learning and the Brain Conference, or Pat Wolfe's The Neuroscience or Teaching and Learning.
- Network with other Brain Junkies, especially those in your local school district. Find others who are looking at new ways of thinking about how students learn and how to improve teaching practices. Explaining and justifying their educational practices within the framework of neuroscience with interdisciplinary collaboration is critical to the future success of neuroeducation.
- Experiment in the classroom.
  Design action research in your classroom and wait for the feedback from your students. I'm sure they'll be happy to provide it for you!

**Conclusion**

Teaching involves changing the brain. Neuroplasticity is when experiences change both the structure and function of the brain. Given that teachers can be said to be "…the orchestrators of neuronal plasticity," (Ansari, 2014). it seems a "no brainer" that educators should be aware of what they're doing to their students' brains.

> "Neuroscience should be required for all students (of education) …to familiarize them with the orienting concepts (of) the field, the culture of scientific inquiry, and the special demands of what qualifies as scientifically based education research."
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> Eisenhat & DeHaan, 2005

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