The Brain Compatible Classroom
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One major neurological understanding that is having an increasingly positive effect on education today is that we are not simply born intelligent. Rather, we are all born with the capacity to be so, and to continuously improve our own intellectual capacities. Educators are doing themselves, and more importantly, their students, a valuable service by remembering that both the child and adult brain is malleable and ‘wired’ to learn, meaning that it can forever change, grow and improve. As such, it is equally important to set, sustain, and explicitly teach high expectations as it is vital that students come to understand that they CAN achieve, or more specifically, that their brains do in fact have the ability to succeed. Substantiating earlier research on multiple intelligences by individuals such as Howard Gardner and Dr. Thomas Armstrong, connecting the principles of brain research with practical instructional practice, such as “arousal” and “engaging with content,” has great potential to unveil learners’ true capacity to ensure continuous intellectual growth.

“Fire it, until you wire it!” ~ Dr. Janet Zadina

According to Kovalik & Olsen, “Genetics was once thought to be an immutable determiner of intelligence.” In other words, “what you were born with is what you would end up with.” However, Neurological research has proven this time and again to be simply untrue. Kovalik & Olsen go on to explain this antiquated principle simply as underdeveloped capacity; indicating that any person is capable of intelligent behaviors only if they have worked on developing such behaviors. Further, as indicated by Costa & Kallick, “intelligence is a set of teachable, learnable behaviors that all human beings can continue to develop and improve throughout their lifetimes.” It is also vital to keep in mind that if one does not believe they CAN, then the brain simply WON’T. Consequently, educators can not expect children to learn what they don’t teach, and children cannot learn what they don’t deem learnable, or within their capacity. As a result, we would be wise to remember that ALL students’ brains CAN learn. Educators must seize opportunities to communicate this to students through classroom experiences so that they may also develop the disposition that their capacity can only be limited by their own will.

Neurological research has also considered the connection between genetic and social/socio-economic factors and intelligence, and has similarly determined that genetics, standards and quality of life do not necessarily dictate intelligence. For example, “Poverty, alienation, drugs, hormonal imbalances and depression don’t [necessarily] dictate failure. While Wealth, acceptance, vegetables, and exercise don’t [necessarily] guarantee success” (Kovalik & Olsen, 2007). What most strongly determines our success is our mindset, which molds our own free will. One way of showing students that their brain’s CAN and thus helping to shape a positive mindset, is through engagement (experiences). Experiences can re-wire the brain and unlock the brain’s true capacity.

Arousal is activated by creating an engaging practice through interactive activities are examples of instructional practices that can increase neurological arousal. This type of arousal actually makes it easier for students to learn. The body reacts with chemical reactions and says to the brain “wake up, this is important to me! I need/want this information.” One will learn such arousing information quicker and with greater retention.

We are what we repeatedly do. Excellence is not an act, but a habit.” ~Aristotle

We have to exert much more effort to be able to store the information for later recall. So, given such persistence, we can in fact learn almost anything. However, there are ‘easier’ ways to learn.

The easy way to learn is by intensively “firing it” (think about it, talk about it, read about it, write about it, and use it, use it, use it) until it is “wired” or permanently stored in the brain. This is an example of how we may study for a “hard” test when certain information or content presented to us doesn’t arouse our brain to an automatically wire-able extent. We have to exert much more effort to be able to store the information for later recall. So,
To understand how this all works from a scientific perspective, neurons hold information in your brain and dendrite branches project from the neurons. As we learn, we grow more dendrite branches. Synapses are where the connections are made between neurons. The more dendrites you grow and the more connections you make, the stronger that learning is wired into your brain. Arousal ignites stronger and more connections, quicker and therefore increases the immediate response to retain information. In the brain the survival of the fittest holds true; the synapses that carry the most messages get stronger and survive, while weaker synaptic connections do not make it. Educators, therefore, have the responsibility to grow dendrites and to also nurture what is grown. If we think about the brain like a map, a network of roads instead of neurons, experiences and skills provided to students in constructive, brain nurturing ways will determine which dirt road will become major highways that can connect to many other roads and take you many other places and which dirt roads will disappear and become covered by nature’s bounty because they are no longer traveled on.

In considering these dynamic attributes of the brain, one may conclude that the Common Core Learning Standards (CCLS) are actually brain compatible, neurologically sound, and developmentally appropriate. As an educational framework that builds upon previous skills throughout grade development, the CCLS are structured and neurologically aligned to brain research; continuously stimulating dendrite growth and strengthening synaptic connections; and thus possessing vast potential of turning dirt roads in the mind into future highways, if utilized appropriately.

“Use it or lose it” is a universally acknowledged premise among neuroscientists, and actually is a powerful instructional concept (Dr. Zadina, 2014). If a student doesn’t interact with or repeat information, it fades and is lost 10-30 seconds after (Goldberg, 2001). Therefore, it is most beneficial to spend the bulk of instructional time having students engage with the content they are taught (Dr. Zadina, 2014). When students are originally presented with information, that information is scattered throughout different areas of their brain. Increasing engagement with the content throughout the lesson provides students with the opportunity to organize the information in their brain so that they can efficiently and effectively recall that information later on (e.g. for questions, independent work, quizzes, or, on standardized assessments). Content engagement opportunities represent chances for students to use the information/skill presented. Some examples include: think out loud, problem solving, brain storming, quick-writes of ideas/reflection, stop-and-think breaks, question prompts, re-phrase ideas, and paraphrasing ideas. In using these strategies, students gain the experience and confidence that they CAN use the information and skills provided to them, which in turn ‘wires’ the information into their brains. Using strategies to help students with disabilities understand that they CAN perform with their peers and like their peers is also vitally important. Activating Prior Knowledge (APK) is an EDI strategy that is recommended for teaching students with disabilities. Content engagement opportunities such as APK simultaneously allow students to make connections with their prior knowledge, not only in the beginning of the lesson but throughout, since it allows students to organize their thoughts as it pertains to their own previously established neural networks. This type of arousal allows for stronger firing and quicker wiring. Another EDI strategy that increases arousal is Pair-Share. While pair-share is a familiar strategy among special education teachers, the neurological importance is not well understood.

“A cool and powerful variation is “Stand and Pair-Share.” This combines movement and speaking: a powerful combo to enhance the learning process. Movement correlates with oxygenation in the brain which also increases arousal in the brain. The old saying is true…We learn better on our feet!”

Research results suggest that when students speak during the learning process, they learn faster, with more transfer, and retention (Dr. Zadina). Sharing what you know is like teaching others and teaching is one of the most powerful ways to make knowledge “stick” or become permanent [see “The Learning Pyramid” on page 4] (Dr. Zadina, 2014). Pair-share directly supports the student’s brain (Hollingsworth & Ybarra, 2009). It gives all students in the classroom opportunities to engage with the content. All of the aspects of pair-share, including socialization, activates arousal, increasing the brain’s activity and chemical reactions that enhance the learning process for both learning speed and retention (Dr. Zadina, 2014).

Some ideas to keep in mind are that pair-shares can take as little as 1-2 minutes. Also, educators should consider creating a structured pair share protocol and have pre-planned stops (with questions/tasks) for pair-shares embedded throughout lessons. Additionally, this strategy may be used spontaneously as a way to support students when they seem “stuck” in the learning process. The following is an example of a simple pair-share:

1. The teacher poses a question/quote/idea.
2. Students take some “1st time” to think independently
3. Students then turn and talk with their elbow partner about it.
4. Then, the teacher may choose a few students to share out to the class.

There are many variations of pair-share, which take more time but are instructionally beneficial and efficient (e.g. think-and-write, pair-and-write, study-tell-help-check, etc.). These are all great pair-share activities that teachers may explore and modify according to the specific needs of the children in their class (Archer & Hughes, 2011).

There are also some added benefits of pair-share specific to the ELL population:

- ELLs get to orally answer every question, which is a must for practicing content language and increasing fluency.
- Wait time is built in, which is a necessity for ELLs inner voice translation time.
- Listening and speaking skills are addressed.
- ELLs can make connections to their own diverse prior knowledge through socializing about the content topic.
- Content and social language development is addressed (keep in mind learning content level language in a second language takes 4-7 years longer than learning it in a first language (Echevarria, Vogt, Short, 2008)
- Reduces peer stigmatism and/or isolation.
- There is built in re-teach or supports from their peers.
- Confidence in answer and answering is established before being called on.

(Hollingsworth & Ybarra, 2013)

Students with disabilities also reap some added benefits:

- Extra wait time is built in for cognitive processing.
- Built in support and re-teach.
- Confidence in answers is established before being called on.
- Reduces peer stigmatism and/or isolation.
- Increases “firing” of information. Students with disabilities often need extra practice with content.
- Increases socialization skill practice.

As there are many variations of pair-shares and other strategies and activities that can be embedded into lesson plans to increase arousal, it would be strategic to begin with increasing a simple and structured form of pair-share more frequently then building upon those protocols with more involved pair-share instructional moves.

Remember, every experience counts, and everything a teacher does impacts a student’s life. While some effects are clearly identifiable and receive praise, some of the most impactful and underlining effects that help students reach successful futures and higher outcomes, such as generating arousal, can only be seen under a microscope. The responsibility of an adult (all educators, teachers, parents and guardians alike) is to explicitly teach what we expect children to learn, and we cannot do that without teaching them simultaneously that they CAN be successful by providing them with the experiences and opportunities that will wire their brains with the understanding that they CAN! This way, they WILL!
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  Presented by Janet Zadina, Ph.D., Assistant Professor in the Department of Neurology, Tulane University School of Medicine.

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