Teaching to the Whole Brain

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Incorporate strategies into your teaching that will engage all areas of the brain.

Any time you get frustrated, stuck, or discouraged with a student, pause for a moment. What's going on in his or her brain? What mental, behavioral, or emotional choices could change their path? Sadly, most educators simply don't know the specifics of how to foster better student learning in the short time they have with students. Proof of that is shown in the NAEP Reading and Math Assessments, where two-thirds of all public school 8th graders across the United States failed to reach grade-level proficiencies in reading and math (NAEP, 2017).

The good news? There are strategies that can help turn those statistics around. Teachers can learn how to foster better learning in their students by gaining a better understanding of how the brain contributes to learning. Teaching with the brain in mind means teaching to the whole child—a holistic approach that includes cognitive, behavioral, and emotional strategies.

Readiness for Learning

Brain-friendly instruction engages three stages of learning: readiness, construction, and consolidation. These are biological stages that brains need for student success. They are not optional.

You must foster student brain preparedness before you begin trying to make learning happen. Readiness is a social, cultural, biological, and internal "state." Your brain *always* triggers a "yes/maybe/no" switch for the learning process. You are with friends, or not. You care or you don't care. Your environment is culturally friendly or oppressive. You are hungry, stressed, sick, or feeling good.

Educators have many ways to prepare a student for learning, but one of the most important ones is to consider the state of the student. It is rare for students to enter a classroom in one of the many optimal readiness states for learning—curiosity, anticipation, feeling accepted, belonging, or even feeling challenged. Yet highly successful teachers evoke those states every day.

Recent evidence (Oosterwijk et al., 2012) reminds us of the critical (and often-overlooked) importance of fostering curiosity, anticipation, and challenge. Each of these states releases a powerful learning-readiness concoction inside the brain, which nearly guarantees that the brain wants to "drink up" the new learning. Indeed, brain network analyses of 65,700

subjects tell us that the positive emotions of joy and satisfaction can inhibit the occurrence of many negative emotions, such as boredom, frustration, distress, or anxiety (Trampe, Quoidbach, & Taquet, 2015).

Here's one quick way to get your students' brains ready for learning. Ask a question that invokes those three states of curiosity, anticipation, and challenge. One example to stimulate curiosity and challenge is, "What do you want to be remembered for when you are 30, and why?" Another way is to use countdowns for activities to create anticipation: "We'll start in ten, nine, eight …." Finally, use an energizer to ramp up blood flow and the brain's "hungry to learn" chemicals (dopamine, norepinephrine, and cortisol). These chemicals also help foster new and lasting connections. You can discover other ideas at Liesl's website at www.lieslmcconchie.com/motivation. Find which tool works best for you and your students, but know that getting them ready for learning should always be your mandatory first step.

Constructing the Learning

With ready brains in place, it is time to start the second phase: building new learning (construction). Here are four cognitive tools that can help students deepen and retain knowledge. One well-known (but under-used) tool is *semantic shaping* (the use of metaphors, stories, examples, and analogies). Young children have fewer existing mental pathways and algorithms that help them navigate life. We learn them as we age. But if you can tap into a developed pathway, you can help students understand new concepts. For example, you could say to the class, "In one way, going to war is like a huge chess game. In other ways, there are many differences; can you name three of them?" Metaphors like this use existing, known brain pathways (in this case, knowing how to play chess) as a bridge to new learning (understanding war) (Boroditsky & Ramscar, 2002).

The second tool is strategically chunk-sizing content. Chunk new content into smaller segments to avoid cognitive overload (overtaxing working memory), or enhance the relevance of the content with bigger chunks. When teachers alter the size of the content chunk, students' brains adapt to process the information differently. Younger students may need smaller content chunks (for example, they may need to learn just one different animal, vocabulary word, or problem a week). Older students might thrive on considering a big-picture, essential question such as, "Why did this country go to war to begin with?", which can open up interest in the economics, cultural, geographic, or social implications of war.

A third tool, multisensory instruction, can engage multiple sensory pathways—an effective approach because the brain blends mind, body, and emotions with no separation. Ask students to use their body to learn through movements and reproducing gestures (Cherdieu et al., 2017), such as "gesturing out" a math problem, which can create clear

connections and cement the memory (Cook, Mitchell, & Goldin-Meadow, 2008). Evoke purposeful and strong emotions to enhance learning and memory.

Finally, you can use "filter-switching," which influences the brain's perceptual bias. Want to deepen students' learning about World War II? Study it through the filter of being Jewish, black, or Japanese. Look at the war from the perspective of a conscripted German soldier or a female U.S. military nurse. This strategy works because it gives your students' brains a new personal reference, a fresh bias, and a new set of boundaries and connections that may have been missing from their own filter set. Each filter will enhance the memory making, with novel and deeper connections for learning (Hawk, Fischer, & Van Kleef, 2011).

Consolidation "Seals the Deal"

The last stage of learning is consolidation, when the learning is "proofed" with error correction, meaning is made, and retrieval is practiced. The brain *rarely* encodes complex information perfectly the first time. Our brain is a *gist* processor; it needs "just enough" information to help you survive. It isn't designed for the detailed information overloads that are commonly experienced in schools (Webb, Turney, & Dennis, 2016). To improve the consolidation of newly learned, detailed learning, give students a brief break. At the secondary level, the time students have between classes can work as this brain break. At the primary level, switch subjects, let students take a walk within the classroom, or do reflective writing. The passage of time (hours or days after learning) gives the brain undistracted time to form memories. Students can also summarize the new learning at the end of a lesson, hang anchor charts of key content, and use retrieval practice (see Pooja K. Agarwal's article on p. 76). Finish off with the transfer of knowledge: "How does this apply to us?"

If you find you don't have time for these tools to help learning last, you'll need to allocate your teaching time differently. Each of these three steps (readiness, construction, and consolidation) is a non-negotiable stage for the brain's new learning.

Movement and Memory

We've discussed some cognitive tools needed to get the brain ready for new learning, but students also need physical activity and movement to improve their learning. Many educators still believe physical education (and of course, recess) takes time away from other subjects without offering a compensatory benefit (Nathan et al., 2018). There's zero evidence to support that belief. A school without movement, self-care, socializing, and games is telling its students, "We don't care about you." Figure 1 gives a quick overview of the benefits of physical activity that may help shift that mindset.

Figure 1: How Physical Activity Affects Learning

What movement does to the brain	How that impacts learning
Physical activity enhances circulation so individual neurons can get more oxygen and nutrients.	Oxygen fuels mitochondria activity, and those cells fuel brain function.
Exercise releases dopamine in the brain.	This improves students' mood, working memory, and effort.
Exercise regulates norepinephrine and heart rate, which is significant in terms of increasing blood flow to the brain.	This increased blood flow to the brain fosters long-term memory and improves focus and attention.
Exercise triggers the release of brain-derived neurotrophic factor (BDNF).	BDNF boosts neurons' ability to communicate with each other. BDNF also accelerates the development of long-term potentiation (LTP), or memory formation.
Daily, physical activity for 20 minutes or more yields the massive benefits of neurogenesis (the production of brand-new neurons).	Neurogenesis boosts mood regulation, cognitive function, and memory.

Physical activity enhances student attention, working memory, and short- and long-term memory. It can also influence classroom behaviors. Would your school invest in a practically free behavior-management program if it could increase on-task behavior by not double, but a robust 28 times? A large study with nearly 1,500 students from three low-income schools demonstrated that such changes can and do happen with the right intervention (Burns et al., 2016).

Student on-task behavior at this school was tracked prior to initiating a long-term physical activity program. After six weeks of regular physical activity, the likelihood of a classroom in the school reaching 80 percent of engaged participation with direct instruction was *seven times greater than prior to the exercise program*. After 12 weeks, the likelihood of on-task

behavior had jumped to *28 times greater* than before the exercise program (Burns et al., 2016).

Social-emotional learning programs emphasize self-regulation, and physical activity is also a highly effective self-regulation strategy. Both acute and chronic stress can be spurred by toxic environments, home-life challenges, trauma, poverty, anxiety, racism, social isolation, sexism, and many other factors. Schools are also facing a rise in teenage depression. Exercise is one of the most effective interventions for stress and depression (Kvam et al., 2016).

A student who has regular exercise habits will make healthier choices when faced with stressful circumstances. In addition, their exercise routines can build stress resilience to help them better cope with future stressors.

So get students up and moving for energizers at least once every 20 minutes. Ensure students get daily physical exercise (recess or PE). That's the first step to boosting cognition, stress regulation, and attitude. Share with families the benefits of physical activity, so there's greater support at home. So many educators wonder why today's kids are different. Here's a starting point: We reduced exercise, theater, dance, and PE in most schools. It's time to get back on board.

Consider Emotions

In framing our whole child approach to the brain and learning, let's now turn to the underlying "climate" at school: Emotions. Emotions are the "rough draft" survival tools used by your brain to get a response from yourself or others. Students', teachers', and leaders' emotions are omnipresent—during 90 percent of your waking hours, you experience emotions (Trampe, Quoidbach, & Taquet, 2015). Yet healthy emotions seem to be less and less common in our schools. Layers of chronic stress (from social media, fewer intact families, immigration-status questions, discrimination, and other factors), as well as insufficient self-regulation skills, can inhibit emotional agility.

What helps foster a climate for learning and better behaviors? Paving the way for more joy and satisfaction in student learning. Joy comes from surprising, relevant events (for example, when a discouraged student succeeds on a test). Satisfaction comes when students feel connected to others, have control over their day, see progress in what they do, and have a sense of purpose or meaning.

Another critical emotion is empathy, known as the caring-connector emotion. To build your empathy for students, listen to them, match their body language, and stop talking. Allow your copycat mirror neurons to answer, "What would it be like to be in their shoes?" Try to discover some of their cultural history and personal narrative by developing a deeper

understanding of their point of view (Hawk, Fischer, & Van Kleef, 2011). Empathy is critical to anti-bullying and school safety efforts.

Certain student emotions or states are correlated with bullying, vandalism, or even shootings. These include anger, holding grudges, and not connecting with others. Teach reconciliation, self-regulation, and empathy. When students act out, start with empathy within yourself. Then remember that many students don't (yet) have the toolbox of emotions they need. Model the responses students need to thrive in school and life.

Heart and Soul

In short, we know what to do to teach in ways that make the brain more receptive. Foster the big three learning phases—readiness, construction, and consolidation—to boost learning. Then use movement and emotion to further develop students' memory, their focus, and their feelings of safety and belonging. Without these, we will just lose students' hearts and souls. If we want to see our students live successful lives, let's make these life skills a school priority. This is what it is all about; teaching with our knowledge of the brain in mind.

Reflect & Discuss

➛ Do you have any tricks for getting your students "brain-ready"?

➛ Can you think of any times during the day where you can give your students brief brain breaks to help cement new learning?

➛ How does emotion and empathy play a role in what students learn—or don't learn?

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