A: Coaches
Teaching Kids About Neuroplasticity

Explicitly teaching students about neuroplasticity can have a transformative impact in the classroom. A central facet of our work as teacher educators is teaching about how the brain changes during learning. Many teachers have told us that these findings have had a positive effect on their expectations for their students and on students' perceptions of their own abilities.

Lessons on discoveries that learning changes the structure and function of the brain can engage students, especially when combined with explicit instruction on the use of cognitive and metacognitive strategies that guide them to learn how to learn (Wilson & Conyers, 2013). Using these strategies effectively produces learning gains, which motivate students to take charge of their learning, which leads to further academic success and may have the additional benefit of alleviating classroom management issues. When students see this process as changing their own brains, the result is a powerful and positive cycle.

The force behind this cycle is students' belief that they can get smarter through study and practice, which enhances their commitment to persist in the hard work that learning some times requires. Nisbett (2009) reports on classroom research involving seventh graders who were taught that learning changes the brain and that intelligence is expandable. Students in this experimental group did better on math tests than peers who did not receive that instruction.

The same dynamic of persisting to succeed applies to teaching. Keeping the idea of brain plasticity at the forefront of your professional practice offers a constant reminder than when students struggle with lessons, it isn't because they can't learn, but because they need more practice and instructional support.

License to Drive

Remind students that they "drive" their own brains, and teach them useful learning strategies. Second grade teacher Donna Garland leads her students in daily exercises to practice cognitive and metacognitive strategies that they can use in learning all their core subjects. Students' desks are decorated with colorful "brain car" cartoons as reminders that they are in charge of their learning.

Room to Improve

Encourage older students to make the most of their brain plasticity, too. By the time high school students make it to Jeremy Green’s AP psychology and U.S. history classes, some seem convinced that their academic shortcomings are innate and permanent. With the goal of dispelling the misconception that "you're stuck where you are," Mr. Green begins the school year by sharing a presentation titled "Your Brain Is Amazing." He reinforces that message throughout the school year by teaching cognitive strategies alongside core content, such as explicit instruction on the organizational skills that students will need to complete a research project, and tricks for puzzling out the meaning of unfamiliar terms. The same message applies to the football players he coaches: "You're either going to get worse or better, but nobody's going to stay the same." "Our role as teachers and coaches is to sell them on the idea that they can get better. If we improve, we win -- period," Mr. Green adds. "We talk about this on the first day of class -- how you're not just what you are today, and that hard work really matters.

B: Organizers
Culture and the Brain: Cultural Neuroscience

Contemporary researchers understand that both nature and nurture play a part in influencing behavioral outcomes, but they come at problems from differing perspectives. The field of *cultural psychology* investigates the influence of the environment (nurture) on human behavior. *Neuroscience* focuses on the role that genetics and biology (nature) play in behavior and cognition. *Cultural neuroscience* addresses the intersection of nature and nurture to understand how cultural and biological factors interact. This field is helping scientists understand how values, practices, and beliefs influence the ways in which our brains function, from thought processes to value judgments, and even the way we see and then perceive objects and people.

Culture influences biology

Research demonstrates that a person in a society that values individualism exhibits different brain patterns than a person from a society that values collectivism. Brain scans were compared for people with two different self-representations (Western independent and East Asian interdependent), and researchers found that Western subjects had more brain activity when thinking about themselves versus thinking about others (e.g. a friend or close relative). East Asian subjects had the same level of brain activity in that region regardless of whether they were thinking about themselves versus a friend or close relative[1].

Research has also demonstrated a cultural influence on the amygdala (the brain region primarily responsible for one's emotions and memory formation)[2]. While being scanned via fMRI, fear faces were shown to two groups: native Japanese in Japan and Caucasians in the United States. Both groups were shown photos of fear faces from each culture, but each group responded more actively when they viewed their own culture's fearful facial expressions compared to those of people from the other culture. The finding suggests that the values, mores, and expressions with which one is raised embed themselves deeply into this part of the brain.

Moving the field forward

Cultural neuroscience researchers integrate theories and methods from psychology, neuroscience, and neurogenetics to understand how culture and the brain interact. They seek to understand psychological and neural mechanisms that lead to complex human behaviors. Researchers' ultimate goal for this field is to create a comprehensive model that allows us to understand differences among populations by accurately describing how culture, environment, and biology interact and influence human behavior.

So remember—it's not a question of either/or, but a question of how nature ***and*** nurture interact to create unique individuals.

C. Recorders

Emotions and the Brain

Learning and emotion are integrated in the brain. In fact, strong skills in emotional regulation strongly predict academic achievement. Emotion acts as a rudder to guide learning. The emotions students feel during an experience become salient labels that steer future learning and decision-making. People gravitate toward situations they have tagged positive and away from situations they have tagged negative or worth avoiding.

From a physiological standpoint, emotions originate in the brain's limbic system which is located between the brain stem and the cortex. The brain stem sends sensory messages through the limbic system to the cortex where much of the thinking and learning occurs. The entrance of this sensory information into the cortex is dependent on the limbic system's interpretation of this information as positive, negative or neutral. If the limbic system interprets the sensory information as negative then its access into the cortex is denied and therefore thinking and learning are inhibited. However, if the sensory information is interpreted as positive then its access to the cortex is granted and behavior is directed in such a way that thinking and learning is enhanced. This interpretation is dependent on one's past experience, memories, and immediate reaction to a current event. (Lawson) Hence positive memories direct positive behaviors toward learning. Likewise, negative memories disable, discourage, and disrupt the learning process.

Neuroscience research shows that emotion and learning are integrated in the brain. This research settles longstanding ideological debates about whether educators should be responsible for emotional development because if educators are involved in intellectual development, they are inherently involved in emotional development. Students are still developing emotional skills and learning to regulate their emotions in childhood and adolescence. Education can support the development of emotional regulation skills. Indeed, this should be a priority, given their critical role in academic performance.

Students are more likely to thrive academically when educators provide a positive learning environment, nurture teacher-student relationships, encourage a sense of community, teach emotional regulation strategies, and provide shelter from toxic stress. Student-centered learning approaches recognize the importance of emotion, calling for a supportive community of educators that can help reduce student stress and apply a knowledge of individual differences in motivation to engage each student.

Emotion is also physically integrated in the brain with executive functioning, a set of mental processes that are critical to learning. Executive function skills connect past experience with present action and include planning, selecting learning strategies, and assessing outcomes. The brain's prefrontal cortex, which regulates executive functioning and some emotional processing, is maturing during adolescence and into early adulthood. It is important for educators to support this development.

D. Energizers

Academics and the Brain

Research on brain plasticity indicates that the brain is learning virtually all the time, in both formal and informal contexts.

Brains Learn in Different Ways Mind, brain, and education research on individual differences contradicts the simplistic notion that each student is either intelligent or not. It points to a more nuanced perspective that recognizes that each student has a complex profile of strengths and limitations. A student may struggle in one area, such as mathematics, yet thrive in another, such as linguistic ability or interpersonal intelligence. Even within single domains, students can have both strengths and weaknesses.

Mind, brain, and education research on individual differences, language learning, literacy, and mathematics suggests that students can follow different learning pathways to master the same core skills. Each individual learns most effectively through experiences tailored to his or her needs and interests. Traditional instruction and standard curriculum most often do not accommodate individual differences. Uniform approaches lose a host of students because they fail to take into account their different ways of learning—or the different languages, cultures, values, goals, and interests they bring to school. Adjusting instruction to meet each student's particular needs often can move students from failure to proficiency.

Brains Need Engagement: Neuroscience research shows that the brain's active engagement is a prerequisite for learning. Changes in the brain's neuronal connections that underlie learning occur only when experiences are active; passive activities do not affect the brain the same way. In educational terms, this suggests that sitting in a classroom listening to a lecture will not necessarily lead to learning.

Student-centered approaches empower students to engage in active learning experiences that are relevant to their lives and goals, both inside and outside the classroom. Brain research is consistent with the student-centered principle of giving credit for mastery of core skills in formal and informal contexts, rather than awarding credit just for spending time in a classroom.

The brain is continually changing, as learning experiences shape its architecture; students' abilities are always developing.	Student-centered approaches to learning use a variety of ongoing assessments to monitor learning and tailor instruction to promote learning.
The brain is learning virtually all the time, in both formal and informal contexts.	Student-centered approaches can capitalize on this through a range of nontraditional learning experiences, such as afterschool enrichment, internships, and community programs.
The brain changes that underlie learning occur when experiences are active, not passive.	Student-centered approaches empower students to engage in active learning experiences that are relevant to their lives and goals.
Learning and emotion work together in the brain.	Student-centered approaches address emotion's central role in education by nurturing positive relationships, teaching emotional regulation skills, and providing shelter from harmful stresses.
Each student has a complex pro le of strengths and limitations and learns best through experiences tailored to his or her needs and interests.	Student-centered approaches customize instruction in each subject to each individual.
Underserved students, including low-income youth and English language learners, sometimes thrive with different instructional techniques than their middle-class peers.	Student-centered approaches have the flexibility to focus on their particular needs.