EDUCATION WEEK

COMMENTARY

Neuroscience Should Inform School Policies

Four things brain science suggests educators should stop doing

By Thomas Armstrong

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Over the past 15 years, neuroscientists have been making significant progress in transforming our ideas about how the brain develops between the ages of 11 and 20. While there has been substantial coverage of these findings in the popular press, comparatively little of this research has filtered its way into the debate about secondary school reform. This seems strange, given the current emphasis in education on evidence-based research. It seems to me that instead of focusing so much attention on "effect sizes" and other abstruse statistical outcomes, educators should be directing more of their attention to the evidence coming from brain-scan studies and other neuroscience research methods, which provide important clues about how we should be teaching our middle and high school students.

The adolescent brain-research finding that most typically breaks into education news relates to adolescent sleep patterns and how teenagers may require later start times for the school day in order to be at their peak efficiency in learning new material. But there is so much more about the adolescent brain that middle school and high school educators should be aware of, both as a motivator to engage in "brain friendly" practices and also to inhibit the use of "brain hostile" practices in the classroom.

Educators should know, for example, that the process of dendrite "pruning" that sculpts a more efficient brain moves from the back of the brain to the front over the course of the first 20 years of life, and that the prefrontal cortex, which is the region controlling inhibition of impulses and the ability to plan, reflect, self-monitor, and make good decisions, doesn't fully develop until the early 20s. This means that while the limbic system or "emotional brain" is working at close to full capacity by early adolescence, the areas of the brain that could temper those feelings and impulses are still in the process of being constructed.

Consequently, key secondary school reform efforts need to emphasize learning activities involving metacognition, goal-setting, planning, working memory, reflection on one's learning, and frequent opportunities to make responsible choices.

Research indicates that while adolescents are able to reason like adults by the age of 15 or 16, they can do this only under "cold cognition" settings (e.g., where there is no emotional pull or peer influence). When they're around their peers or in an emotionally charged situation ("hot cognition"), teens'

prefrontal-cortex functions don't work as well, which is why a teenager will respond affirmatively to an anti-drug curriculum in the classroom, but then go out and smoke weed with his friends at night.

What is essential for kids at this time of life is to be engaged in real-life learning experiences and peer-learning connections that put them under conditions of "hot cognition," where educators can help them along in the process of integrating their impulsiveness (positively viewed as excitement and motivation) with their reasoning abilities.

—Jonathan Bouw for Education Week

The implications for reform of secondary school are clear. Schools should provide more opportunities for students to be involved in apprenticeships, internships, service learning, community-based learning, small peer-learning groups, entrepreneur-based programs, and student-directed project-based learning. Courses need to be given in middle school and high school that teach students about how their brains work, how to use metacognition to direct their learning, and how to self-regulate their feelings under conditions of duress.

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Research suggests that the adolescent brain—subject to the vagaries of dopamine (which connects to reward and pleasure) and serotonin (which connects to well-being and happiness) in the brain—is more susceptible to stress than the brains of either children or adults. Consequently, a key part of the secondary school curriculum should involve the teaching of stress-reduction methods, such as mindfulness meditation, yoga, and aerobic activity; exercise breaks during class; a strong physical education curriculum; and a broadly based extracurricular sports program for all students, not just the star athletes.

Findings from adolescent-brain research also suggest a number of things that educators should stop doing so much of at the middle school and high school levels. For example:

• Classroom teaching that focuses largely on delivering content through lectures and textbooks fails to engage the emotional brain and leaves unchanged those prefrontal regions that are important in metacognition.

• Public posting of grades and test scores (a practice which in this data-driven world appears to be increasing) humiliates and shames students in front of their highly valued peers.

• Locking students into a set academic college-bound program of courses takes away their ability to make decisions about what most interests them (a process that integrates the limbic system's motivational verve with the prefrontal cortex's decisionmaking capacity).

• The elimination or cutback of physical education and/or recess in favor of more time for academics increases teenagers' already stressed-out nervous systems.

Some educators may be content to continue making the conversation on secondary school reform be about raising academic standards, creating more-rigorous courses, or achieving "excellence" in other ways. But the most tangible element in middle school and high school learning is the adolescent brain—this incredible three-pound organism designed by nature over hundreds of thousands of years to react with excitement and awe to the amazing world that stretches out before it.

Neuroscience research tells us that the teenage brain is exquisitely sensitive to environmental influences. This neuroplasticity makes it vulnerable to a wide range of societal dangers—traffic accidents, drug abuse, suicide, violence. But it also makes it acutely sensitive to the influence of teachers, for good or for ill.

That means it's far better for our middle and high school teachers to be familiar with the workings of this extraordinary organ, and learn how to respond constructively to it in the classroom, than to go on teaching for test results and leaving our future adults to their own devices.

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