Empower Students With Brain Knowledge

BY JUDY WILLIS

Teachers can help transform students' capacities to excel with brain-favorable approaches to teaching and learning.

In addition to physically and emotionally growing by leaps and bounds throughout their K-8 experience, students' brains also are maturing. And just as it is important for educators to understand the brain maturation process, students also can be empowered to recognize the basics of how the brain learns. This knowledge gives students powerful keys to success in school, careers, relationships, and all other aspects of life.

When educators have background knowledge of the neurology of learning, they can explain to students how the brain works and apply more brain-favorable approaches to preparing them for academic success. As a result, students apply more effort—and will be better able to fulfill their learning potential.

Neuroscience 101

Every experience, thought, and emotion is the result of brain cells communicating through existing circuits, or forming new links with neighboring or distant neurons. These physical connections strengthen communication efficiency each time they are used. This

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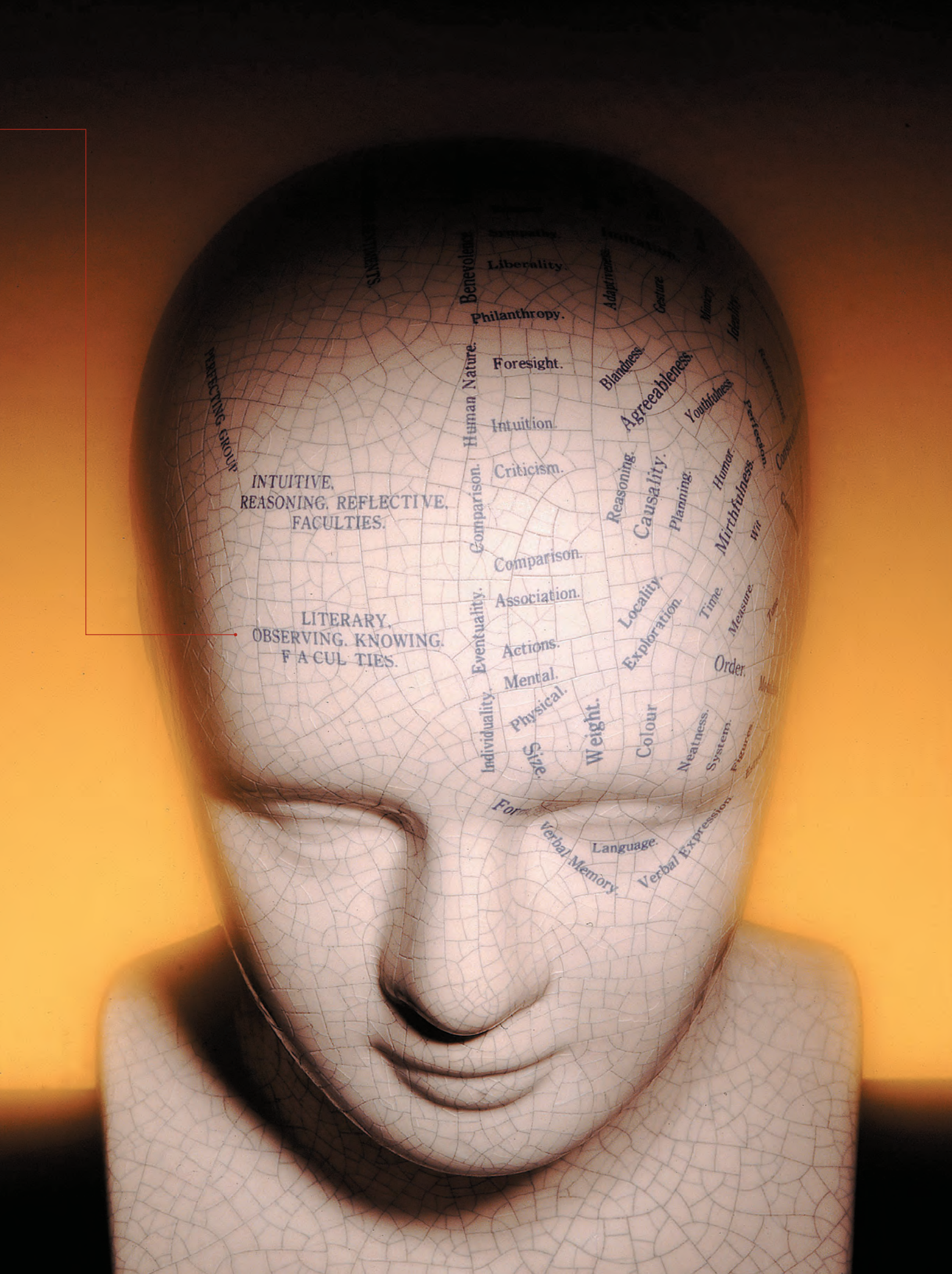
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System.
Verbal Memory.
Language.
Verbal Expression.

is the process of neuroplasticity, the brain's unlimited potential to grow in memory and intelligence. During the process, new pathways are constructed when information is added to existing networks. The electrical activation that carries the communication is the stimulus for the brain to make these networks stronger by growing new connections (dendrites and synapses) and putting down more layers of insulation (myelin) around the message-carrying axons.

Teaching Tip: Teachers don't need to use complex textbooks or spend hundreds of dollars on commercial products to explain to students how the brain works. They can read articles about how the brain learns and share their understanding with students using student-friendly words and examples, such as "You already know that your muscles become stronger and larger when you exercise, but did you know that exercising your brain makes it grow also?"

A "Tune-Up" for the Brain

Application of brain research to learning reveals that superior learning takes place when experiences are enjoyable and relevant to students' lives, interests, and experiences. Neuroscience research uses brain neuroimaging, such as PET scans and fMRI scans, to evaluate the influence of one's emotional state on learning, judgment, memory storage, and information retrieval and transfer.

Memory construction is affected negatively when learning takes place during emotional states of fear, anxiety, high stress, or depression. There is a switching station in the brain that determines if incoming information is sent up to the highest thinking, *reflective*, prefrontal cortex or down to the *reactive* lower brain. There, conceptual, retrievable memories are not constructed and the behavioral responses of fight, flight, or freeze are the involuntary reactions.

Feeling embarrassed or confused, for example, prevents new information from reaching the long-term memory networks of the higher brain. When students are stressed, bored, frustrated, or feel helpless or confused by classroom instruction—which is often the case with today's overly packed curricula—the input is sent down to their reactive lower brains and active learning stops.

Teaching Tip: Explaining the influence of emotion on successful brain processing empowers students with the knowledge that past failures are not predictions of their future potential, and that their emotional state before and during learning influences successful memory. Help students build and practice strategies, such as calming visualizations and mindful breathing, that they can use when they feel their stress levels increasing.

Develop Executive Functions

K-8 students haven't yet developed their prefrontal cortex. This is the area of the brain that governs "executive functions" that regulate mental processes such as analysis, objective judgment, and goal setting, or even the concept that effort toward a goal results in progress. Even though these networks are still maturing well into a person's 20s, purposefully developing executive functions—even at the elementary level—changes the wiring of students' brains and capacity to learn. Teachers can stimulate this process and help nurture development throughout the school year by helping students recognize incremental progress toward goals. Even though teachers may have explained the benefit of incremental progress, students need to see for themselves how effort and practice really make them better.

Teaching Tip: Provide students with opportunities to use executive functions such as goal setting. Use Web-based tools to help students keep track of time spent on measurable learning, or see how practice results in success over time. Use additional strategies to promote reflection about what strategies they used for success. I've had my students start by graphing time spent practicing basketball free throws or learning to keyboard relative to the accuracy of their shots or keyboarding speed and accuracy. These skill-building activities help students recognize the correlation between effort and time spent and their increasing achievement. Students who might habitually expect failure can use these non-academic experiences to gain motivation to direct effort toward academic success.

Build a Better Brain Pattern

Students get excited about learning—and using their brains as tools—as they are taught about the brain's unlimited potential to grow in memory and intelligence. It's important to teach students that they can help to develop their own brains by seeing how new information fits with existing memory circuits in their brains. Students are empowered when they understand that their brains most successfully store information by patterns.

The brain turns data gathered from the senses—what is seen, heard, touched, or how the body moves—into learned information by encoding it into already existing patterns. The brain is designed to recognize and generate patterns by storing memories linked in networks based on relationships that are learned or discovered. These patterns are actual networks of connected brain cells, each holding bits of information that interrelate based on an underlying

Principal ONLINE

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"Teaching Students A 'Brain Owner's Manual,'" by Judy Willis, **further details how to teach students about their brains**.

David A. Sousa's *What Principals Need To Know About the Basics of Creating Brain-Compatible Classrooms* is **an accessible guide that examines the basics of brain-compatible learning**. It's available from the National Principals Resource Center.

similarity or a unifying concept.

When students understand their brains' pattern construction and recognition system, they can use strategies such as activating prior knowledge, making real-world and personal connections, and other pattern-stimulating strategies to achieve the most effective information intake, memory construction, and information-retrieval pathways of brain connections. The brain activates these memory patterns to predict the correct response to new information that is interpreted as related to the category of the stored memory network. Based on our brains' process of patterning, we are able to activate and retrieve the best prior knowledge to make predictions and anticipate what might happen next and the best response.

The benefits of patterning are undeniable and the habit is accelerated when students are encouraged to actively relate new information to positive past experiences, personal interests, and opportunities to experience the use of the new information in the context of meaningful applications. The application of useful strategies, such as pattern matching and manipulating, is further reinforced when students have guidance to help them recognize the incremental progress they achieve when they apply such strategies. This practice is better than defining their success or intelligence by a test, report card grade, or rote memory, which is far from a complete assessment of what they have learned.

Teaching Tip: Teachers can develop classroom patterns to guide students' brains to expectations that help them prioritize information. For example, teachers can emphasize parts of instruction by using a "brain cap," system, explaining to students that they will wear the cap when they are saying something particularly important. Students develop a pattern of refocusing attention and writing down information when they see the cap.

Learning That Transfers

The goal of education should be to teach students how to be successful beyond the classroom. With the force-feeding of overstuffed curriculum, there is little classroom focus on application of new learning to new situations beyond those in which the facts are taught in a classroom. Students need to acquire the valuable life skill of conceptual transfer, which does not come from IQ or memorization, but rather from emotional and personal relationships to learning that transform isolated facts into conceptual knowledge.

In their new book, *The Understanding by Design Guide to Creating High-Quality Units*, Grant Wiggins and Jay McTighe use a soccer analogy to illustrate the value of learners seeing the "big picture" and the authentic purpose for learning specific skills and knowledge. They describe the interplay between discrete skill learning and practice (sideline drills) with opportunities to use the skills in relevant and authentic situations (playing the game). Instead of waiting until learners master all of the individual skills before letting them on the field, students have opportunities from the beginning to play the game, and then work to refine needed skills. That same interweaving of real application opportunities to skill development makes for meaningful, effective, and motivated learning—both on the athletic field and in the classroom.

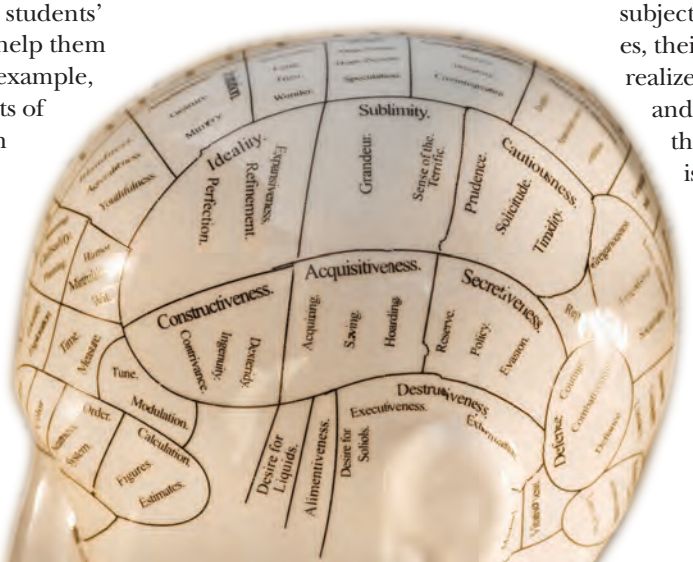
Teaching Tip: Promote conceptual instead of isolated learning experiences by encouraging successful pattern recognition and matching so that new information is linked to the "big ideas." The integration of facts into concepts, which results from the practices of pattern building and review, promotes the neuroplasticity that connects information into usable categories of information.

Lifelong Intelligence Growth

Students who use strategies to store information in the related patterns of concepts, and repeatedly stimulate these neural networks by review and application, are primed to take advantage of the brain's ability to expand its intelligence. This potential for lifelong intelligence growth is the result of the brain's ability to construct and expand memory networks. With each prediction and feedback experience, intelligence increases, as seen in increasingly successful responses to subsequent similar situations.

Educators who understand how the brain processes information and use brain-research-compatible strategies to increase students' motivation, effort, and success, give students much more than the ability to memorize. Their students will be better prepared to achieve their life goals. They will have the accumulation of learning stored efficiently in concept networks to make increasingly more accurate choices, hypotheses, and analyses, and creative innovations.

Students who learn about brain-favorable approaches to learning will develop confidence and restore motivation as they learn to recognize their incremental progress in challenging subjects. And through further successes, their confidence will grow as they realize that their social, emotional, and academic intelligence is within their control, and their potential is virtually limitless. P



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