Brain-based research is providing new strategies for identifying and treating the many causes of slow learning.

Mel Levine and Mary-Dean Barringer

A student’s inability to keep pace with the demands of the classroom can produce painful feelings of inadequacy, performance anxiety, depleted motivation, and even behavioral maladjustment. Too often, schools respond to such students with well-intentioned procedures or guidelines that fail to meet the needs of the thwarted learner.

IN BRIEF

Thanks to recent research and clinical observations, educators no longer have to apply a “one-size-fits-all” approach in helping struggling students. This article provides examples of how brain differences affect learning and suggests classroom remedies that do not call for special education.
However, in recent years an impressive body of research in the neurosciences, psychology, education, and related fields has provided promising answers to the frustrating quandaries schools have faced when students are unable to keep pace in reading, writing, mathematics, and specific subject areas. The message is clear: There can be a wide range of mechanisms underlying delayed skill acquisition. To devise strategies without identifying such mechanisms represents a “shot in the dark” approach.

**How Brain Differences Affect Learning**

Difficulties in reading and writing often stem from underlying neurodevelopmental dysfunctions. Here are examples of some of the most common forms of these dysfunctions.

**Reading**

In a second-grade classroom, Jackson is more than a year behind in reading. His word decoding is agonizingly slow and effortful, and he has trouble distinguishing phonemes, the language sound units that comprise words. Because Jackson processes sounds indistinctly, he has trouble matching them with symbols and blending them to shape words when he reads. He needs substantial help in mastering and maneuvering within the English sound system.

A classmate, Mary Lou, is also having a hard time with word decoding, but her problem is different. She can’t retain and subsequently recognize visual patterns (e.g., -ought and -tion) that repeatedly show up in words. She needs help discerning word families while recognizing recurring meaningful letter patterns.

Another classmate, Samuel, is terrified and embarrassed when he is called on to read aloud. Unlike Jackson and Mary Lou, Samuel can recognize patterns and distinguish clearly between different language sounds, but he can’t match words on paper to those stored in his vocabulary; he is having problems with a process called “lexical access.” He will need assistance in rapid word-finding and in pairing letter combinations and words with their meanings.

In the same classroom, Alexandra is having problems understanding because of limitations in the size and richness of her vocabulary, while Jenny is weak at comprehending complex sentences. Meanwhile, Victor keeps forgetting what he’s reading while he’s reading it because he is experiencing the effects of a weak active working memory. By the time he’s reached the end of a paragraph, he has lost the beginning of it.

Finally, there’s Amanda, who is enduring lingering problems with word decoding. She expends so much effort unraveling individual words that she has few resources left to comprehend what she is reading. She has little or no automatic word recognition and will benefit from a great deal of drill with sight words.

**Writing**

Edgar, a seventh grader, displays a rather bizarre way of holding a pencil; his thumb overlaps two fingers while holding the pencil tightly close to its tip and perpendicular to the paper. As a result, his writing is slow, sparse, and barely legible. To correct his graphomotor dysfunction, Edgar needs to work on altering his grip, and by using writing instruments that give him more traction.

Edgar’s friend Eugene shares his contempt for writing, even though he has a normal pencil grip and legible letter formation. Unlike Edgar, Eugene is slow in writing because he is hesitant and imprecise in speaking. Since oral language underlies written language, his writing is similar to that of a child two or years younger. Eugene needs to work on vocabulary building and on constructing sentences from key words.

Latisha is another seventh grader who can’t seem to get her thoughts down on paper. Although she is a legible writer with excellent oral language, she is thwarted by writing’s intense memory demands—the requirement to recall simultaneously, rapidly, and synchronously spelling, punctuation, capitalization, and grammar rules as well as vocabulary words, ideas, facts, and letter formations. This is a common middle school affliction and Latisha needs to address this by writing in stages instead of trying to do it all at once.

**Understanding Dysfunctions**

The mechanisms underlying the kinds of common reading and writing deficiencies described above have critical implications for elementary and middle schools.

- Most dysfunctions are not uncovered through traditional diagnostic or achievement tests. However, they are most readily visible to a regular
In order to better understand how students’ neurodevelopmental profiles affect their learning and performance, eight constructs—groupings of related functions—help organize thinking and communication about learning differences.

**Attention.** This includes the ability to concentrate, focus on one thing rather than another, finish tasks, and control what one says and does.

**Temporal-sequential ordering.** Whether it’s being able to recite the alphabet or pushing a response button on Jeopardy, being able to understand the time and sequence of pieces of information is a key component of learning.

**Spatial ordering.** The ability, for instance, to distinguish between a circle and a square, or to use images to remember related information.

**Memory.** Even if people are able to understand, organize, and interpret complex information at the moment, their inability to store and later recall that information can dramatically affect their performance.

**Language.** Developing language functions involves elaborate interactions between various parts of the brain that control such abilities as pronouncing words, understanding different sounds, and comprehending written symbols.

**Neuromotor functions.** The brain’s ability to coordinate motor or muscle functions is key to many areas of learning, including writing and keyboarding.

**Social cognition.** One of the most overlooked components of learning is the ability to succeed in social relationships with peers, parents, and teachers. Students strong in other areas may have academic difficulties because of an inability to make friends, work in groups, or cope with peer pressure.

**Higher-order cognition.** This involves the ability to understand and implement the steps necessary to solve problems, attack new areas of learning, and to think creatively.

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classroom teacher who has been taught how to identify dysfunctions by observing students and studying samples of their work.

- The interventions a teacher devises to help a struggling child often turn out to be tactics that could benefit everyone else in the class by spotlighting certain steps in the learning process.

- A majority of dysfunctions can be managed in the regular classroom without direct special education services. Special educators and school psychologists can serve as diagnostic and management consultants to the classroom teacher.

- In helping children who are delayed in learning, it is especially important to diagnose and manage their strengths because positive findings sometimes can be used to help bypass obstructive dysfunctions. In the long run, these strengths ensure that a child can be successful even while learning slowly.

**Understanding All Kinds of Minds**

In 1995, financier Charles Schwab and pediatrician Mel Levine founded All Kinds of Minds, a nonprofit institute whose mission has been to gather and synthesize the latest knowledge relating to learning and learning differences, and translating that information into policies and practices usable by schools, parents, and clinicians. Through Schools Attuned, an innovative service model and professional development program, the institute seeks to broadly disseminate this body of neurodevelopmental knowledge.

At the core of the Schools Attuned program is a framework that stems from the theory that the human brain is made up of a network of neurodevelopmental functions, and that a subgroup of these functions is responsible for learning and academic performance. Teams of educators from elementary, middle, and high schools gather at sites across the country to learn about the eight constructs of neurodevelopmental function (see box) and how to observe, analyze, and describe the learning patterns of their students.

Case studies are used to help teachers precisely pinpoint breakdowns in the processes needed for learning and academic productivity while formulating effective management plans for students with obstructive learning differences. Using the tools and processes provided through Schools Attuned, these teams of educators often work with students in the prereferral process, generating effective strategies and interventions without labeling students with attention deficit hyperactivity disorder or a learning disability. Knowing how to describe and name a particular breakdown in the learning process greatly facilitates teachers, students, and parents in understanding and managing it.

**Applying Neurodevelopmental Knowledge**

Bev Tepper, principal of Paint Creek Elementary School in Bloomfield, Michigan, has involved her entire faculty in the Schools Attuned program. She created S.A.M. (Schools Attuned Management) teams that initially focused on supporting the prereferral process required by special education regulations. Now all students are having their strengths and affinities recognized and celebrated through individual learning profiles. Tepper
points out that the continued reduction in unnecessary referrals for special education evaluations has more than offset the cost of training.

Bruce Shepard, assistant principal at Kitty Hawk Elementary School in North Carolina, uses the Schools Attuned program as a way to create a common language and vision in keeping with the school’s motto: “All children can learn.” Shepard, who went through the program with his staff, says: “As a trained scientist, these constructs weren’t new to me. But Schools Attuned made the concepts accessible to all our educators.”

What matters most to teachers and principals is discovering a set of instructional strategies that can improve school performance for a particular student. Lisa Galleli, a veteran teacher at Kitty Hawk, describes her overall management plan for one such student. “He had significant graphomotor weaknesses with spelling and writing. But he really shined in his social skills and that made all the difference in the world. He was also good at math and problem-solving. We used his strengths to keep him motivated with success while tackling his writing problems.”

Equipped with all that we have learned about individual brain development during childhood and adolescence, we have a ripe opportunity to ensure that every child is educationally fulfilled in his or her own way. Often, when we see children not progressing at the expected grade level, we rush to find out what is wrong, and how to get them on track. But in our search for what is going wrong, we forget the more important starting question: “What is going right?” Children who seem to be learning too slowly invariably harbor latent strengths that will someday make their contributions. Let’s respect and cultivate their minds!

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**WEB RESOURCES**

The All Kinds of Minds Web site provides valuable resources and more information on the Schools Attuned program.

www.allkindsofminds.org.

Created as a companion site to Misunderstood Minds, the PBS documentary on learning differences, this Web site offers scientific explanations behind learning differences and strategies to aid success in school.

www.pbs.org/misunderstoodminds

In the Research Report from the May/June 2007 issue of Principal, Nancy Protheroe presents some key findings from cognitive research on learning and highlights several instructional approaches compatible with our growing understanding of how the brain works.

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