Introduction

Teachers and students get up every school-day morning hoping to succeed. That hope is not always realized because many factors exist that affect the degree of success or failure in a teaching and learning situation. Some of these factors are well beyond the control of the teacher and the school staff. What teachers *do* control, of course, are the decisions they make about what to teach and about how to present the lesson so that student learning is most likely to occur. In making these decisions, teachers draw on their knowledge base and experience to design activities, ask questions, and respond to the efforts of their students.

Educators are finding themselves searching for new strategies and techniques to meet the needs of an ethnically, culturally, and socially diverse student population. Some tried-and-true strategies do not seem to be as successful as they were in the past, and more students seem to be having difficulty acquiring just the basic skills of reading, writing, and computation. The number of public school students being diagnosed with specific learning disabilities is growing. In 2002, 8.3 percent of the total public school population was classified as having specific learning disabilities and speech or language impairments, compared to 7.7 percent 10 years earlier (USDE, 2003).

This situation is generating frustration in different parts of the educational community. As a result, educators are searching for new approaches, parents are seeking alternative schooling formats (charter schools and vouchers), and state legislators are demanding higher standards and testing. Added to this mix are the demands and sanctions of the federal No Child Left Behind Act of 2001 and the 2004 Individuals with Disabilities Education Improvement Act's focus on responsiveness to intervention. All these activities are in full swing, but it remains to be seen whether these efforts will result in more effective services to students with special needs.

Meanwhile, more students diagnosed with learning disabilities are being included in regular classrooms, and teachers continue to search for new ways to help these struggling students achieve. As more students with learning difficulties enter regular classes, general education teachers are finding that they need help adjusting to the added responsibility of meeting the varied needs of these students. Consequently, special education teachers will need to collaborate more than ever with their general education colleagues on ways to differentiate instruction in the inclusive classroom.

General and special education teachers will need to collaborate more than ever on ways to differentiate instruction.

WHO ARE SPECIAL NEEDS STUDENTS?

For the purposes of this book, the term "special needs" refers to students who are:

- Diagnosed and classified as having specific learning problems, including speech, reading, writing, mathematics, and emotional and behavioral disorders
- Enrolled in supplemental instruction programs for basic skills, such as those receiving federal funding under Title 1 of the Elementary and Secondary Education Act
- Not classified for special education or assigned to Title I programs, but still struggling with problems affecting their learning

The term, as used here, does not refer to students with learning problems resulting primarily from hearing, visual, or physical handicaps.

CAN BRAIN RESEARCH HELP?

Teachers may face significant challenges when meeting the needs of children who have learning problems. Trying to figure out what is happening in the brains of these children can be frustrating and exhausting. Until recently, science could tell us little about the causes of learning disorders and even less about ways to address them successfully.

The nature of the difficulties facing students with learning problems varies from maintaining focus, acquiring language, learning to read and write, and solving mathematical problems to remembering important information. Thanks to the development of imaging and other technologies, neuroscientists can now look inside the live brain and gain new knowledge about its structure and functions. Some of this research is already revealing clues to help guide the decisions and practices of educators working with students who have special needs.

Because of the efforts of scientists over the years to cure brain disorders, we know more about troubled brains than we do about healthy ones. Early ventures into the brain involved extensive risks that were justified by the potential for curing or improving the patient's condition. But now, essentially risk-free imaging technologies (such as functional magnetic resonance imaging or fMRI) are giving us greater knowledge about how the normal brain works. In just one project, scientists compiled a database of brain scans of about 500 children without apparent health problems aged 7 days to 18 years. This information will help researchers study different stages of brain growth and expand our understanding of what normal brain development is (Evans, 2006).

Students with learning problems comprise such a heterogeneous group that no one strategy, technique, or intervention can address all their needs. Today, more than ever, neuroscientists, psychologists, computer experts, and educators are working together in a common crusade to improve our understanding of the learning process. Comparing the functions of brains without deficits to the functions of brains with deficits is revealing some remarkable new insights about learning and behavioral disorders. Some of the findings are challenging long-held beliefs about the cause, progress, and treatment of specific learning disorders. Educators in both general and special education should be aware of this research so that they can decide what implications the findings have for their practice.

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WHAT IS IN THIS BOOK?

This book provides research information about common learning disabilities to prospective and current teachers and administrators so that they may consider alternative instructional approaches. It will help answer such questions as:

- How different are the brains of today's students?
- What kinds of strategies are particularly effective for students with learning disabilities?
- What progress is research making in discovering the causes of different learning disorders?
- Will brain research help us make more accurate diagnoses of learning problems?
- Can schools inadvertently promote ADHD-like behavior in students?
- Can students with native language problems learn another language?
- How does the brain learn to read?
- Can young brains with developmental reading problems be "rewired" to improve reading?
- How can we address the emotional needs of students in the classroom?
- What more do we know about autism spectrum disorders?

Authors must decide on the sequence that the content of a book follows. My decision here was to start with a look at basic brain structures and functions (Chapter 1) and then move on to explaining some problems that can arise during brain development (Chapter 2). Because attention is a critical component of nearly all learning, that seemed to be the next logical topic (Chapter 3). Then I turned to examining learning difficulties in the basic skill areas of speech, reading, writing, and mathematics (Chapters 4 to 7). Thereafter follows a discussion of emotional and behavioral problems (Chapter 8) and autism spectrum disorders (Chapter 9). I conclude with an effort to tie this information together into a review of effective ways to serve students with learning disabilities (Chapter 10).

Practical applications of the research can be found in the chapter sections called **Strategies to Consider,** which suggest how educators might translate the research into school and classroom practice so that students with learning difficulties can be more successful. Obviously, some of the strategies would be appropriate for all learners. However, the suggestions have been written specifically to address the special needs of students with learning difficulties.

Some of the information and suggestions found here came from advocacy organizations, including the National Institute of Mental Health, the National Information Center for Children and Youth With Disabilities, and the Learning Disability Association of America (see the **Resources** section). I have sought out original medical research reports whenever possible, and these are included in the **References** section of the book. A few of the strategies are derived or adapted from the third edition of my previous book, *How the Brain Learns*, also published by Corwin Press.

This book is not intended to be a comprehensive text describing all the types of barriers that can affect learning. Rather, it focuses on the common difficulties and disorders that any teacher is likely to encounter in the general or special education classroom. On a broader scale, the updates on research and some of the suggested strategies may benefit all who work to educate children.

STRATEGIES TO CONSIDER

Guidelines for Working With Students Who Have Special Needs

Teachers should consider these guidelines to help students with special needs succeed. The following general strategies are appropriate for all grade levels and subject areas.

- **Capitalize on the student's strengths.** This is more likely to give the student a feeling of success and lessen any feelings of inadequacy that flow from the disability.

- **Provide high structure and clear expectations.** These students do better in an organized environment and need to know what is expected of them. Take nothing for granted, and make sure the student is aware of acceptable and unacceptable types of behavior.

- **Use short sentences and simple vocabulary.** These students often have difficulty processing complex sentence structures and usually have a limited vocabulary. Behavior problems can arise when the student is unclear about what the teacher said.

- **Allow flexibility in classroom procedures.** For example, permit students with written language difficulties to use tape recorders for note taking and test taking.

- **Make use of self-correcting materials that provide immediate feedback without embarrassment.** Because many of these students have a short attention span, activities that give immediate feedback are desirable. Students can assess their own progress quickly and without knowing each other's results.

- **Use computers for drill and practice and for teaching word processing.** Computers are patient devices, and many programs provide varied opportunities to practice and usually give a running score of the student's progress. Word processing programs can often convince students to try creative writing despite any problems with written language.

- **Provide positive reinforcement of appropriate social skills.** Appropriate social behavior at school is likely to be repeated if it is positively reinforced. Look for opportunities to "catch the student being good."

- **Recognize that students with learning disabilities can greatly benefit from the gift of time to grow and mature.** These students often progress slowly, but many progress nonetheless. Patience with them can be rewarding for both teachers and students.

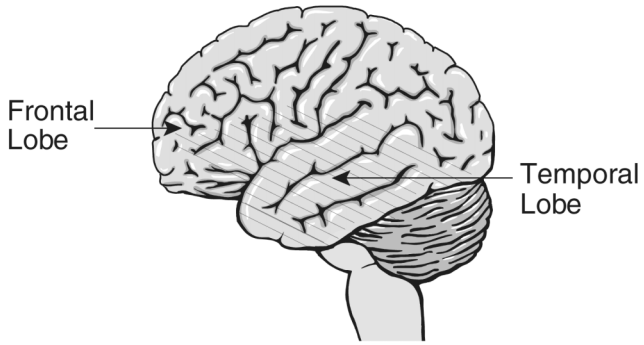

Figure 3.2 The lined area shows the parts of the frontal and temporal lobes on both sides of the brain that are smaller in children with ADHD. These areas control behavior and contain some components of the attention systems.

Comparing high-resolution MRI brain scans of children and adolescents with ADHD with scans of a non-ADHD control group, researchers found that the frontal and temporal lobes on both sides of the ADHD brains were significantly reduced in size (Figure 3.2). These cerebral areas help moderate behavior and contain some components of the attention systems (Sowell, et al., 2003). Lack of development in the frontal lobes can reduce its ability to control the excesses of emotional responses. Scans also revealed that children and adolescents with ADHD had significantly smaller total brain volumes than subjects without ADHD (Castellanos et al., 2002).

Several imaging studies have shown that ADHD brains function differently when performing the same tasks as non-ADHD brains. Although the participants with ADHD performed only slightly worse than the non-ADHD controls, they appeared to activate an entirely different network of brain areas than that seen in the non-ADHD participants (Bush et al., 1999). This may be because the impaired function of the executive control system in ADHD reduces the ability to recruit the same brain regions and strategies needed to accomplish cognitive tasks that non-ADHD individuals would use. Researchers speculate that the brain with ADHD compensates for this deficit by relying more on visual-spatial and motor processing than on verbal strategies (Fassbender & Schweitzer, 2006).

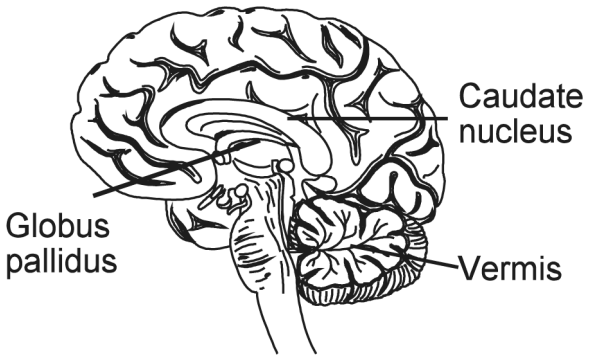

Figure 3.3 Brain scans have shown the globus pallidus, caudate nucleus, and vermis to be smaller in many ADHD adults.

Another contributing factor may be an imbalance in certain neurotransmitters that help the brain regulate focus and behavior. Deficiencies in the neurotransmitters dopamine and norepinephrine would affect arousal and alertness. Low serotonin is linked to impulsivity and erratic behavior. But what could cause the imbalance? Several neuroimaging studies have shown that two structures in the limbic area (the *cordate nucleus* and the *globus pallidus*) and one in the cerebellum (the *vermis*) are smaller in adults diagnosed with ADHD than in adults without the disorder (Figure 3.3). Further, it seems that these structural differences are strongly associated with a genetic defect.

The cordate nucleus and globus pallidus appear to be involved in the dopamine network. Dopamine is a neurotransmitter that, among other things, helps to control attention and coordinate movement. In the individual with ADHD, the smaller size of these two structures may decrease the effectiveness of dopamine, resulting in difficulty sustaining attention (Barkley, 1998; Raz, 2004). The vermis is thought to contribute to smooth motor coordination. Problems with this structure may lead to the hyperactive and impulsive behaviors seen in ADHD individuals. Another study reported that adults diagnosed with ADHD