

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 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 2012–2013, 13 percent of the total public school population was classified as having specific learning disabilities and speech or language impairments, compared to 8.3 percent 10 years earlier (National Center for Education Statistics, 2014).

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 accountability through higher standards and standardized testing. Added to this mix are the requirements of the federal Every Student Succeeds Act and the Individuals with Disabilities Education Improvement Act's focus on response to intervention. All these activities are in full swing, but stakeholders are debating whether these efforts are resulting in more effective services to students with special needs.

Meanwhile, more students diagnosed with learning disabilities are being included in general education classrooms, and teachers continue to search for new ways to help these struggling students achieve. As more students with learning difficulties enter general education classes, their 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

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than ever with their general education colleagues on ways to differentiate instruction in the inclusive classroom.

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 I 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. It all started in just one project a decade ago, when scientists compiled a database of brain scans of about 500 children without apparent health problems aged 7 days to 18 years. That information helped researchers study different stages of brain growth and expanded our understanding of what normal brain development is (Evans, 2006). Today, that database has thousands of scans.

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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UNDERSTANDING THE EFFECTS OF POVERTY

Studies have shown for decades that children growing up in severe poverty do not perform as well academically as their peers. Explanations for this achievement gap have centered on environmental and social issues, although some researchers suspected that the gap was associated in part with delays in brain growth and development. Now we have evidence that living in severe poverty can indeed affect the brain, especially in those cerebral areas responsible for cognitive processing, language development, and memory. A six-year study by researchers at the University of Wisconsin-Madison showed that children living in severe poverty had significantly smaller volumes in their brains' frontal and temporal lobes, and the hippocampus (Luby, 2015).

The frontal lobe is responsible for directing attention, controlling emotions, planning, and performing complex cognitive processing, while the temporal lobe provides for language comprehension and auditory processing. The hippocampus is critical for converting information into long-term memory. Children in poverty are often under severe stress from crowded housing, exposure to violence, and poor nutrition. Furthermore, they receive less nurturing and stimulation from their parents. Despite these dire conditions and their negative effects on brain growth and development, it is possible that brain plasticity can compensate for cognitive deficits when these children are placed in a more nourishing and stimulating environment.

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 disorder (ASD)?
- What kinds of assistive technologies are available for students with learning difficulties?
- What are some important current and future trends in special education?

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 disorder (Chapter 9). I conclude with an effort to tie this information together into a review of effective ways to serve students with learning disabilities, as well as a look to future trends in special education (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 fourth edition of my book, *How the Brain Learns*, also published by Corwin.

Most chapters have a section on *Assistive Technologies* that remove barriers to learning for students with specific learning difficulties. It is important for school personnel to do a thorough assessment of a student’s needs and the tasks that a student is expected to accomplish in order to select the appropriate technology and software. To be of value, there should be a reasonable expectation that the selected assistive technology

will improve student learning. A good database of assistive technologies can be found at www.techmatrix.org.

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.

As we gain a greater understanding of the human brain, we may discover that some students designated as “learning disabled” may be merely “schooling disabled.” Sometimes these students are struggling to learn in an environment that is designed inadvertently to frustrate their efforts. Just changing our instructional approach may be enough to move these students to the ranks of successful learners. My hope is that this book will encourage all school professionals to learn more about how the brain learns so that they can work together for the benefit of all students.

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A NOTE ABOUT EFFECT SIZE

In several sections throughout the book, you will see references to the *effect size* of a particular intervention. Effect size is a statistical measure of the strength of an intervention and is commonly used in educational studies, especially in meta-analyses. It is a quantitative attempt to measure how much of an impact a particular intervention had on the experimental group compared to the group that did not have the intervention (control group). The scale for these types of studies runs in values from 0 to 2.0, although the full scale is from -3.0 to 3.0 . Educational researchers generally see effect sizes of 0.2 to 0.4 as small, 0.5 to 0.7 as medium, and 0.8 and higher as large. Effect sizes are another indicator that educators can use to guide them in selecting interventions for students with learning difficulties.

A WORD OF CAUTION

Several chapters contain lists of symptoms that are used to help identify specific disorders. The symptoms are included only for informational purposes, and they should not be used as a basis for diagnosis or treatment. Any individual who exhibits persistent learning problems should be referred to qualified clinical personnel for assessment.