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Council for Exceptional Children

See Companion Website for detailed correlations between chapter content and Council for Exceptional Children Standards; **www.ablongman.com/hallahanLD3e**

CEC Knowledge and Skills Discussed in This Chapter

1. The foundational development of the construct called "learning disability."
2. How the definition of learning disabilities has developed over the years and continues to change.
3. How the development of the learning disability definition has affected schools.
4. The medical, legal, and ethical issues relating the definition to the identification of individuals as learning disabled, especially in the areas of gender equity and cultural/linguistic differences.
5. The relationship between definition and potential causes or etiology of the disability.
6. Consideration of ultimate goals, costs, and optimal student outcomes to determine effective methodologies.

Basic Concepts

1

I guess I'm going to have to understand a lot about learning disabilities now.

Irene Smith, Jamal's mother

Almost everyone understands learning disabilities in an informal sense. However, students who have learning disabilities, teachers, school administrators, parents, speech pathologists, psychologists, physicians, and many others need to understand the term *learning disability* in a more formal way. They need to know that learning disability is a distinct category of special education, that it has legal status based on U.S. federal and state law (and similar laws in other countries), and that there is a substantial body of research about it. They should have fundamental knowledge of the characteristics of individuals with learning disabilities, the causes of learning disabilities, how to assess learning disabilities, teaching methods for treating learning disabilities, and the long-term outcomes for individuals who have learning disabilities.

Jamal

When told that her son Jamal had a diagnosis of learning disability, Mrs. Smith wanted answers to a lot of questions. What caused this disability? How might it have been prevented? What is it like to have a learning disability? What can be done about it? How will this disability change my interaction with my child? Can he learn anything? Does this mean my child will not graduate from high school? Will he ever be able to take care of himself? What kind of job will my child be able to get and keep?

Learning disability is one of many differences characteristic of people in contemporary society. Other differences include intellectual *giftedness, cerebral palsy,* athletic prowess, *emotional* or *behavioral problems,* musical ability, *mental retardation, deafness,* artistic talent, *blindness,* and so forth (Hallahan & Kauffman, 2003). If we observe differences only in behavior, not in physical appearance, we may wonder whether the disability is real or imagined. We may also wonder whether our ignorance or bias is confusing the issue. To many people, learning disabilities seem less tangible than some other disabilities (e.g., cerebral palsy), and therefore some may wonder whether learning disabilities actually exist.

Teachers and those preparing to be teachers are likely to have other questions. If I have a student with a learning disability, what am I supposed to know about such students? What causes these disabilities? What are my responsibilities in such cases? How

do I decide the best ways to teach this student? Where can I turn for help? What works for such students? Will I really be able to help this student? Because learning disabilities are by far the most prevalent of student disabilities, these questions are most likely to be prompted by an encounter with a student who has a learning disability.

Finding the answers to such questions depends on gaining a basic understanding of underlying issues facing the field of learning disabilities. These issues are undoubtedly some of the most complex and challenging in all of education. They form the core of understanding learning disabilities. In this chapter, the authors introduce cases showing what learning disabilities are like, consider why studying learning disabilities is important, describe problems that impede progress in understanding learning disabilities, and discuss ideas that help to organize what we know about learning disabilities.

What Are Individuals with Learning Disabilities Like?

Like everyone else, each individual with a learning disability is unique. People with learning disabilities are not a type; they are individuals who, for whatever reason, require specialized instruction and access to accommodations and other adaptations that will permit them to succeed. To help show how different individuals with learning disabilities can be from one another, we refer to two students' stories throughout this book. In this section, we introduce Jamal, the son of Irene Smith (see the quote at the beginning of this chapter), and Shannon, the daughter of Daniel and Kerri Ireland. In this and subsequent chapters you will find references to Jamal and Shannon. On the Website for this book (www.ablongman.com/hallahanLD3e) are school records and other information that provide a more comprehensive perspective on the cases of these students.

Jamal

Shannon

Jamal

Jamal

Jamal Smith was six years old and in first grade at Hereford Elementary School when we documented his story. He talked a lot about TV shows, dinosaurs, and rockets. He had recently developed an interest in space travel and very quickly was able to name all of the planets in the solar system. He was good at sports, a natural leader, liked by most of his peers, and unusually happy. When his teacher started a lesson, he was usually one of the most eager students. He followed directions right away, volunteered to answer the first questions the teacher asked, and tried to help his fellow students. On the playground, he helped organize games, was relied on as an arbiter by other students, and often was the star of his team.

His teacher, Alice Hamilton, observed that "he is a bright boy, but he just doesn't get some things. He can talk your ear off about things that he knows, but he's got no clue in reading." She noted that he sometimes seemed

impatient during lessons that she was presenting, as if he already knew the content and wanted to learn about something else. "It's as if he's way ahead of me," she said. "He'll pick up on what I'm doing and seem to have an instant understanding of it. Then he's ready to move on."

Ms. Hamilton was so concerned about Jamal's performance early in first grade that she contacted Jamal's mother, Irene Smith. The two women knew each other from meetings two years earlier when Ms. Hamilton had taught Patricia, Jamal's older sister. Ms. Hamilton remembered that Patricia had been a good student, not a star, but quite capable of earning passing grades.

They met, and Ms. Hamilton explained her concern: "Jamal seems really bright, but I'm worried that he's not keeping up in reading. I have kids who are taking to reading like a duck to water, but I'm afraid Jamal could be sinking. He seems too smart to have trouble. He knows so much. He's so verbal. So I want to know whether or not you see this, too."

Jamal's mother was shocked. She did not see the problem. She explained, "Of course, I don't know much, but he can read whole books to me. He doesn't have any reading problem."

"Well, I've seen him read one or two whole books very well," replied Ms. Hamilton. "However, when I ask him to read the same words that are in the book when they are on other pages or I write them on paper, he just can't do it. I think he might have memorized the books he can read."

"Oh, really?" asked Mrs. Smith.

"Yes, really. I also gave some simple tests to Jamal, and he can't do things that lots of kindergartners can do," Ms. Hamilton told Mrs. Smith. "He can't take words apart into syllables or take sounds and blend them together into words."

"Are you saying he's retarded? He's not retarded," said Mrs. Smith quickly.

"No! He's a bright boy. That's what worries me." Ms. Hamilton continued, "If he has problems, I think we should catch them now. It's not that he's mentally retarded, it's that he has some specific learning problems. And they're problems that can be helped. We just need to get the help."

"Well, what does it take to get the help?" asked Mrs. Smith.

"We've already tried some things," Ms. Hamilton replied. "We gave him extra reading time and some special attention, but that hasn't taken care of things. He still didn't take off."

"I think we need an evaluation for special education," said Ms. Hamilton. "That means that some people will give some tests to Jamal and they'll report what they find to a team of people. And you'll be part of the team. If the team says, 'learning disability,' then Jamal can get special education. That means he can get special help with his learning problems."

"Well, I don't understand much of anything about this." Mrs. Smith shook her head. "But, I guess I'm going to have to understand a lot about learning disabilities now."

Several months later, as you will learn in subsequent chapters, Jamal was identified as eligible for special education because of his problems with

some components of early reading. The decision to grant him special education services was not an easy one, and what happened along the way is instructive. Some members of the educational team charged with responding to the problems Jamal was experiencing were reluctant to apply the label of learning disability. Jamal's teacher advocated strongly that he be eligible for special education, but the school psychologist recommended delaying the eligibility decision.

Shannon

Shannon

Shannon Ireland's case is different from Jamal's. Jamal was popular, but Shannon was shy. Shannon was good at art, and Jamal excelled in sports. Shannon's case began in an earlier era of special education, when some ways of providing services were more popular than today. It also is different because, of course, Shannon's problems were different. She was a different person.

Shannon was fourteen and in the eighth grade at Bishop Memorial Middle School when we wrote this book. When she was in third grade, a team of professionals decided that Shannon was eligible for special education because of a learning disability. Shannon's special education teacher during elementary school was Peter Martens. He remembered Shannon as "sort of shy and 'spacey.' But as long as I kept her engaged, kept involving her, she learned like a champ."

During the elementary grades, Shannon had problems in virtually every academic area. She also had a quiet demeanor and a tendency to lose focus on class activities. After several years of Mr. Martens's intensive remedial instruction, Shannon learned to read and understand what she read, to spell reasonably, and to compose essays and poems. She continued to have trouble with mathematics, lagging behind her classmates, and she never really broke out of her shyness. As you will learn later (Chapter 9), Shannon also had a second disability—attention deficit hyperactivity disorder (ADHD)—that became more apparent as she progressed into less structured educational situations.

To help you get to know Shannon, we have two documents. The first is an excerpt from a letter from Mrs. Ireland, and the second is a statement by Shannon herself (see the Case Connections box on page 6). In one part of a letter to a university professor written when Shannon was in middle school, Shannon's mother wrote about Shannon's school history and her continuing problems with math.

> I will always be grateful to Pete Martens, Shan's first special education teacher. Of course, Danny and I both wish that Pete could have taken care of her math problems the same as he took care of her reading. But, you know, you can't have everything, and we're just thankful that she can read and write now. At least she'll be able to get through high

school and maybe get some college. And there are lots of jobs that she could do that don't require math.

Anyway, in second and third grade, before she got into Pete's class, she thought she was dumb and that nobody liked her. Then he made her work really hard and she started to catch on. She started learning and feeling better about herself. He told her, "You're just going to have to work harder at some things. Just like some people would have to work really hard on drawing, but drawing's easy for you." Actually, I think it was the phonics he made her learn.

Now she's in middle school and, next year, high school. She's still worried about not being popular, that she doesn't have many friends. Of course, the ADHD is a struggle for her. And, also, she still has trouble with math. She can do her basic facts now pretty well, but it's all gotten a lot harder with algebra coming on. First it was just story problems, but now they want her to do pretty complicated math. We just want her to be able to get a diploma, so we're keeping with it.

Why Is It Important to Understand Learning Disabilities?

Appreciation for the individuality of students who, like Shannon and Jamal, have learning disabilities is one of the most important concepts teachers can learn. Accepting differences or variations in student performance and altering instruction so that students who have different needs will have successful outcomes is the goal of teaching students with learning disabilities. The goal of teachers—regardless of whether they teach in general or special education and whether they work exclusively with students with learning disabilities, those who have no disabilities, or those who have more substantial disabilities—should be to meet the unique needs of their students. Perhaps the most important concept that the study of learning disabilities has contributed to education is that individuals have different strengths and weaknesses and those strengths and weaknesses should be taken into account in planning and providing education for them. Education needs to be flexible and adapt to students' characteristics.

In addition to the philosophical benefits of treating individuals as unique learners, there are other reasons it is important to understand learning disabilities. In the next few sections, we explain some of these reasons.

Council for Exceptional Children

CEC Knowledge Check

What is the major goal of teachers who work in the field of special education?
CC1K1, CC1S1

Most Teachers Will Have Students with Learning Disabilities

As we show in a subsequent section, more than 5% of school-aged children are identified as having learning disabilities. Teachers in the primary or elementary

CASE CONNECTIONS

Shannon

Shannon's Reflections on Learning Disabilities

In an essay she wrote on her own when she was in eighth grade, Shannon described her feelings about having a learning disability.

> I think there are people in this world with disabilities that are treated unfairly. I have learning disabilities in math (story problems mostly) that I have always had as long as I can remember. I did not think it was important for me to be good in everything and I have to work really very hard in other subjects so I don't have all the time in the world. Now I feel it is unfair if I have to take the exit exam to get my diploma because I just know I won't do good in the math part and then I won't get that diploma and then what am I going to do?
>
> People should have a chance. Just because you have a disability doesn't mean you can't learn. It just seems like if you have a disability then they figure you are a failure. Well, I'm *not.* I have to work hard, but I can learn.
>
> I know about my disabilities. It's called dyscalculia and it means "disability in calculating" but I can calculate pretty good. I'm not real fast, but I can do it if you give me the time or if somebody would show me how to make those calculators work I could be faster maybe. I have trouble with making equations and factors and multiplying fractions. Dyscalculia isn't as popular or known as dyslexia which they thought I had too. Dyscalculia is important though because if it keeps me from getting a diploma that would be terrible injustice.
>
> So I think they should let me have extra time on the test and let me use calculators. What would they think if they had to do something that their whole life depended on it and they weren't good at it? Well that is what it feels like to me.

As would most early adolescents, when Shannon wrote this statement she still saw the world in terms of personal fairness. From reading it, you may already have ideas about her skill with written expression, her attitude, and her ability. As you read this text, you will learn more about her, and some of those ideas probably will change. Even though you may already know a lot about them, we hope you will come to understand learning disabilities in a more complete way.

grades who have 20 to 25 students in their classes will have at least one and perhaps two or more students who have learning disabilities. If they share students with other teachers (for example, by grouping students for arithmetic instruction), this number may increase.

Teachers in the secondary grades, where students move from class to class, will have even more students with learning disabilities in their classes. Secondary teach-

ers may have as many as six or seven class periods per day with 20 to 25 or even 30 students in each period. If the school in which these teachers work identifies 5% of its students as having learning disabilities, these teachers may have six or more students with learning disabilities.

It is important for those who teach these students to know about the nature, causes, assessment, and treatment of learning disabilities. Teachers who work primarily with students who have other disabilities, such as emotional or behavior disorders, also will benefit from knowing about learning disabilities, because these students often will have learning characteristics that are similar to those of students with learning disabilities. One of the most helpful ways to lessen behavior problems is to address the academic learning performance of students with emotional or behavior disorders (Kauffman, 2005).

For general educators—those who teach regular classes of elementary students or content classes composed of secondary students—one consequence of having students with disabilities is that they will become members of a team who collaborate to address the educational problems of those students. They will have to become familiar with these students' **individualized education programs**—the **IEP,** as it is called, is a document that describes special practices needed by students because of their unique educational needs. Teachers will need to adjust their teaching to align with the requirements of the IEP.

individualized education program (IEP) a written agreement of educators and parents, required by IDEA, that includes statements about the student's education needs and the special education and related services that will be provided

Understanding Learning Disabilities Helps Us Understand Learning

When explaining a concept, it is often helpful to illustrate both what the concept is and what it is not. For example, we might explain that citrus fruits share certain features with but are different in certain ways from fruits that fit in other categories (berries, drupes, pomes). Similarly, understanding a complex concept such as "learning" means being able to explain what learning is not, what happens when learning does not happen. In this way, studying learning disabilities—when learning does not happen in the usual ways—helps us understand normal learning. Learning disabilities has provided a stimulus for research that has benefited not just students with learning disabilities but also students who have not been identified as having learning disabilities (Gerber, 2000).

Research on preventing reading problems illustrates the reciprocal relationship between research on learning and not learning. Because reading problems are common among students with learning disabilities, scholars in the field of learning disabilities have studied ways of preventing reading problems from the inception of the field through today (Blachman, Tangel, Ball, Black, & McGraw, 1999; Coyne, Kame'enui, & Simmons, 2001; de Hirsch, Jansky, & Langford, 1966; Liberman, 1971; Liberman, Shankweiler, Fischer, & Carter, 1974; Torgesen, 2002b; Vaughn, Levy, Coleman, & Bos, 2002; Vellutino, Steger, & Kandel, 1972). These researchers have found that certain component skills and teaching procedures are critical to learning to read and that many students with learning disabilities lack these skills. If young children do not have these critical skills or are not taught them, they are likely to fail in the beginning stages of reading. Once they have begun to fail, it is difficult

for them to catch up with their peers. (We explain more about these skills in later chapters on spoken language and reading.)

By conducting many studies that helped identify these missing skills in early reading over more than 30 years' time, learning disabilities scholars have contributed to educators' and psychologists' understanding of normal reading development. Their contributions are apparent in the report of the National Reading Panel (2000), an extensive report on early reading instruction. Dozens of studies conducted by researchers associated with learning disabilities were included in the panel's report or appeared in journals such as *Learning Disabilities: Research and Practice, Learning Disability Quarterly,* and *Journal of Learning Disabilities,* as well as other publications primarily associated with special education.

Many Students with Learning Disabilities Can Contribute Valuably to Society

Popular discussions of learning disabilities, such as those one finds on the Internet (e.g., www.dyslexiaonline.org), often identify accomplished people (for example, inventor Thomas Edison, physicist Albert Einstein, entertainer Whoopi Goldberg, business tycoon Charles Schwab) as having learning disabilities. As we discuss later in this and other chapters, even when educators have extensive assessment data, it is very difficult to determine whether an individual has a learning disability. We do not have the assessment data needed to determine whether many of the historical and popular figures said to have had learning disabilities actually had learning disabilities. Therefore, absent independent diagnostic data, it is especially difficult to identify a historical figure or even a contemporary celebrity as having a learning disability.

Nevertheless, teachers and others sometimes point to these notable individuals to show that those who have learning problems can also produce great accomplishments. These teachers may believe that these examples can motivate students with learning disabilities to try harder and achieve more. We question whether such an approach produces better outcomes for students with disabilities. If learning disability means "lazy and dumb," then motivating students will be critically important. Although motivating students is an important part of teaching, we doubt that it is the most important part of teaching students with learning disabilities.

It is clear that, learning disability or not, individuals such as Edison can overcome personal difficulties and contribute significantly to society. This is true for many individuals who have had learning disabilities and yet have gone on to have successful careers in many areas. Although not all will achieve the prominence of a Charles Schwab, these individuals can find quiet success in holding a good job, raising a fine family, contributing to their communities, and succeeding socially.

Why Are Learning Disabilities Controversial?

Probably more than any other category of special education, learning disabilities has been the subject of dispute and debate. Stanovich described the contentious history of learning disabilities:

> The field of learning disabilities . . . has a checkered history that is littered with contention, false starts, fads, dead ends, pseudoscience, and just a little bit of hard-won progress. It seems as though the field is constantly getting into scrapes, is always on probation, is never really secure. Why is this? (Stanovich, 1988, p. 210)

In asking this question, Stanovich was reflecting over the relatively brief time period—fewer than 30 years when he posed it—that scholars have studied learning disabilities. During that time, many people have made outstanding contributions to learning disabilities. The five people described in Figure 1.1 (pages 10–11) were among the earliest contributors. They, along with many who followed them, have helped put learning disabilities on a more solid, scientific footing. This hard-won progress was made despite ongoing controversy.

Controversy has enlivened discussion about learning disability since the inception of the field, even before Samuel Kirk, speaking to a group of parents in Chicago in 1963, suggested *learning disability* as the term for referring to children who were having difficulty in school but who were not considered disabled by mental retardation or emotional disturbance. As Kirk put it:

> Recently I have used the term "learning disability" to describe a group of children who have disorders in development, in language, speech, reading, and associated communication skills needed for social interaction. In this group I do not include children who have sensory handicaps such as blindness or deafness, because we have methods of managing and training the deaf and the blind. I also exclude from this group children who have generalized mental retardation. (Kirk, 1963)

In earlier decades, these children's difficulties had been variously categorized as mild exogenous mental retardation (mild mental retardation caused by brain injury), minimal brain dysfunction (behavioral abnormalities similar to but less severe than those caused by brain injury, although brain damage cannot be verified), dyslexia (extreme difficulty in reading), perceptual impairment (persistent difficulty in making sense of sensory stimulation), hyperactivity (excessive motor behavior and inattention), and slow learning (a child whose intelligence is not far enough below average to indicate mental retardation) (Hallahan & Cruickshank, 1973; Hallahan & Kauffman, 1977; Hallahan & Mercer, 2002; Mann, 1979; Wiederholt, 1974). The complexities inherent in these and other terms were eventually distilled into the concept of learning disabilities.

So why is providing special education for students who do not have obvious physical disabilities, mental retardation, or other disorders but who do have clear underachievement such a problem? To begin with, much of the difficulty lies in the problem of defining learning disabilities. Although the layperson may have a general idea of what the term means, there are substantial disagreements among professionals of the many disciplines concerned with learning disabilities about precisely how the term is defined.

There are both theoretical and practical reasons that it is important to define phenomena, including categories of special education. The theoretical reasons include the idea that unless one can define something in clear terms, one does not really know that thing (Forness & Kavale, 1997; Hammill, 1990). The practical

FIGURE 1.1 Profiles of Selected Influential Figures in the Field of Learning Disabilities

William M. Cruickshank

Cruickshank's career in special education spanned 46 years. He served on the faculty of both Syracuse University and the University of Michigan. In the late 1950s, he directed a federally funded research project establishing classes in the Montgomery County (Maryland) public schools that were recognized by many as the first organized attempt to teach students with learning disabilities in public schools. He was also one of the early pioneers in the notion of interdiscliplinary cooperation and fought to ensure that special educators would have equal footing with other professionals. In 1978, he founded the International Academy for Research in Learning Disabilities.

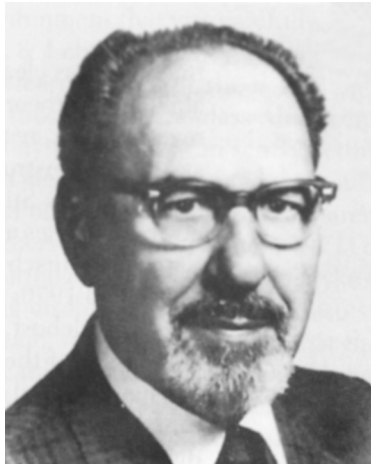
Samuel Orton

Orton was a specialist in neurology and neuropathology. He theorized that dyslexia was attributable to some form of brain injury and that special techniques were required to instruct those with dyslexia. Orton felt that nearly all dyslexic symptoms could be explained by mixed dominance of the cerebral hemispheres and that the mixed dominant state of the brain was transferred hereditarily. In one of his most influential books, *Reading, Writing, and Speech Problems of Children* (1937), he described a systematic phonics program reinforced with kinesthetic aids (letter tracing). He coined the term *strephosymbolia,* which he described as "word blindness."

Katrina de Hirsch

De Hirsch adopted some of Orton's thinking as a starting point for her own discussion of children with "specific dyslexia," or what Orton would have called "strephosymbolia." She studied in Buenos Aires, attended the University of Frankfurt am Main, and went on to pursue a degree in speech pathology at London's Hospital for Nervous Diseases. She believed that disorders of speech in children can be placed on a continuum of language dysfunction. At Columbia-Presbyterian Medical Center she started the first language disorder clinic in this country. Her thinking in the 1950s and 1960s overlapped with other perceptual-motor theorists in that she believed that for students with reading disabilities who can be predicted to fail, formal reading instruction should not take place until success has been achieved with perceptual-motor and oral language instruction.

FIGURE 1.1 Continued



Samuel Kirk

One of the most significant figures in learning disabilities, Kirk became deeply involved in the language disabilities of children rather late in his career. He was employed as a psychologist at the Wayne County Training School and simultaneously enrolled in courses at the University of Michigan. After 15 years of clinical experience, graduate work by students, and field testing, he and his colleagues produced the landmark test *Illinois Test of Psycholinguistic Abilities* (ITPA) in 1968. Although the ITPA was first conceptualized as a diagnostic test in the area of mental retardation, it became one of the primary tests identified with learning disabilities. The term *learning disabilities* has been attributed to Kirk, who used it in public during a presentation to a group of parents at the first conference of the Association for Children with Learning Disabilities in 1963.

Barbara Bateman

Bateman began her career in special education as a teacher of children with multiple disabilities. While at the University of Illinois, where she received her Ph.D. in special education, she worked extensively with Samuel Kirk, publishing a paper in 1962 that was among the first to use the term *learning disabilities* in its title. After working for many years in instructional aspects of teaching students with disabilities, she began to focus her attention on special education law and received her law degree from the University of Oregon Law School in 1976. In more recent years, her book *Better IEPs* (Bateman & Linden, 1998) has informed teachers how to write legally correct, instructionally relevant IEPs.

Source: Photographs of Cruickshank, Orton, and Kirk are from *Introduction to Learning Disabilities* by T. Lovitt, 1989, Boston: Allyn and Bacon. Copyright 1989 by Allyn & Bacon. Reprinted by permission. Photograph of de Hirsch is from *Psychoeducational Foundations of Learning Disabilities* by D. Hallahan and W. Cruickshank, 1973, Englewood Cliffs, NJ: Prentice-Hall. Copyright 1973 by Prentice-Hall. Reprinted by permission. Photograph of Bateman is courtesy of Barbara Bateman.

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CEC Knowledge Check

Of the five influential leaders in the early development of learning disabilities, which two are the most important? Support your choices. LD1K1

considerations pertain to legislation, funding, identification, research, and treatment. When advocating for funds and legislation with lawmakers, it helps to be able to articulate clearly for whom the funds and legislation are intended. Definitions aid clear communication; if people have markedly different definitions of learning disability when they talk, the chances of miscommunication increase. As legal statements, definitions lead to criteria for determining who is eligible for, in this case, learning disabilities services; clear definitions produce clearer criteria which, in

turn, lead to more consistent eligibility decisions. Definitions also affect our estimates about how many individuals might have a disability. If a clear, easily communicated definition produces consistent criteria, then we can expect that a count of how many individuals have been found eligible for services will be more precise than when a count is based on an ambiguous definition.

Defining Learning Disabilities Has Been Difficult

Today, people from nearly every walk of life recognize the term *learning disability.* Learning disability is one of 13 specific categories in special education, is defined by federal and state laws, and is a specialization for which teachers in many states must obtain special teaching certification. In some parts of the world, the term *learning disability* is equivalent to the U.S. term *mild mental retardation* or includes what in the United States would be called "behavior disorders" (Opp, 2001; Stevens & Werkoven, 2001). However, the concept of learning disabilities as referring to below-average achievement that is not explained by other intellectual or sensory factors has gained almost complete acceptance among educators and the general public in the United States and many other foreign countries (Mazurek & Winzer, 1994; Winzer, 1993). Although it is widely accepted, the concept of learning disabilities is not yet completely formed. Like other complex but useful concepts, it repeatedly requires refinement (see Bradley, Danielson, & Hallahan, 2002; Kavale & Forness, 1985, 1992; Lyon et al., 2001; Moats & Lyon, 1993; Torgesen, 1991).

To say that considerable debate has surrounded the issue of defining learning disabilities is an understatement. At least 11 definitions have enjoyed some degree of official status in the field (Hammill, 1990), and professional and federal committees have convened to write a definition that is acceptable to the various constituencies. During the early 2000s, the President's Commission on Excellence in Special Education (2002) conducted hearings about special education that influenced the changes in special education law debated in 2003 by the U.S. Congress. The definition of learning disabilities and how states implemented it was one of the most controversial areas examined by the President's Commission. Understanding how the definition of learning disability has evolved provides context for how learning disability is defined today.

Definitions of Learning Disability Have Changed

When he spoke to the meeting of parents, professors, and others in Chicago in 1963, Kirk recommended that the group adopt the term *learning disability* to identify the children about whom they were concerned. Kirk argued that the term *learning disability* was the best choice of various alternatives, some of which Kirk said referred to causes of problems (e.g., such as the terms *brain injury* or *minimal brain dysfunction*) or that referred to behavioral manifestations of the problems (e.g., the terms *hyperkinetic behavior* or *perceptual disorder*). Kirk said that the term *learning disability* placed the emphasis on problems that could be assessed and changed. The group followed Kirk's recommendation and formed an organization called the Association for Children with Learning Disabilities (ACLD). This group later renamed

itself the Association for Children and Adults with Learning Disabilities and, most recently, the Learning Disabilities Association of America (LDA). Consisting of both parents and professionals, LDA is the major organizational voice for parents of children with learning disabilities.

Although Kirk is often said to have coined the term *learning disability* in his speech to the people who would form the ACLD, the term had been used earlier (Hodges & Balow, 1961; Kirk & Bateman, 1962; Thelander, Phelps, & Walton, 1958). In the 1962 edition of his influential introductory text on exceptional children, Kirk defined learning disability as follows:

> A learning disability refers to a retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, writing, arithmetic, or other school subject resulting from a psychological handicap caused by a possible cerebral dysfunction and/or emotional or behavioral disturbances. It is not the result of mental retardation, sensory deprivation, or cultural and instructional factors. (Kirk, 1962, p. 263)

Five components in Kirk's definition have appeared in many of the definitions that followed it:

1. subaverage achievement (reading, writing, arithmetic) or achievement-related behavior (speech or language)
2. intra-individual differences—the possibility that the subaverage achievement or achievement-related behavior occurs in only one or some areas, with average or above-average achievement in the other areas
3. reference to *psychological processing problems* as causal factors or at least as correlated factors
4. suggestion of *cerebral dysfunction* as a possible causal factor
5. exclusion of other disabling conditions (e.g., *mental retardation*) and environmental conditions as causal factors.

As various groups and individuals grappled with defining learning disability, other components emerged, too. These included:

1. life-span problems—the idea that learning disabilities persist into adulthood
2. social relations problems—that learning disability may also affect behavior in social situations and even that social problems may be a form of learning disability
3. *comorbidity*—the possibility that learning disabilities may occur in combination with other conditions or individual attributes (especially giftedness or serious emotional disturbance).

Kirk's initial definition of learning disability was the first of many efforts to define the phenomenon, with subsequent definitions changing the emphasis on one or another of the components and adding or omitting components. Table 1.1 (pages 14–15) lists a few of the many definitions that have been offered since Kirk's early effort to define the term and shows how each definition emphasized different components.

TABLE 1.1 Definitions of Learning Disabilities and Their Common and Unique Features

Kirk (1962, p. 263)	A learning disability refers to a retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, writing, arithmetic, or other school subject resulting from a psychological handicap caused by a possible cerebral dysfunction and/or emotional or behavioral disturbances. It is not the result of mental retardation, sensory deprivation, or cultural and instructional factors.
Bateman (1965, p. 220)	Children who have learning disorders are those who manifest an educationally significant discrepancy between their estimated intellectual potential and actual level of performance related to basic disorders in the learning process, which may or may not be accompanied by demonstrable central nervous system dysfunction and which are not secondary to generalized mental retardation, educational or cultural deprivation, severe emotional disturbance, or sensory loss.
NACHC (U.S. Office of Education, 1968, p. 3)	Children with special (specific) learning disabilities exhibit a disorder in one or more of the basic psychological processes involved in understanding or in using spoken and written language. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling or arithmetic. They include conditions which have been referred to as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, developmental aphasia, etc. They do not include learning problems that are due primarily to visual, hearing or motor handicaps, to mental retardation, emotional disturbance, or to environmental disadvantage.
94–142 (U.S. Office of Education, 1977, p. 65083)	The term "specific learning disability" means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, speak, read, write, spell, or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia. The term does not include children who have learning disabilities which are primarily the result of visual, hearing, or motor handicaps, or mental retardation, or emotional disturbance, or of environmental, cultural, or economic disadvantage.
NJCLD (Hammill, Leigh, McNutt, & Larsen, 1981)	"Learning disabilities" is a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction. Even though a learning disability may occur concomitantly with other handicapping conditions (e.g., sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (e.g., cultural differences, insufficient-inappropriate instruction, psychogenic factors), it is not the direct result of those conditions or influences.
LDA (Association for Children with Learning Disabilities, 1986, p. 15)	Specific Learning Disabilities is a chronic condition of presumed neurological origin which selectively interferes with the development, integration, and/or demonstration of verbal and/or nonverbal abilities. Specific Learning Disabilities exists as a distinct handicapping condition and varies in its manifestations and in degree of severity. Throughout life, the condition can affect self-esteem, education, vocation, socialization, and/or daily living activities.

TABLE 1.1 Continued

IDEA (Individuals with Disabilities Education Act Amendments of 1997, Sec. 602(26), p. 13)

A. IN GENERAL—The term "specific learning disability" means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations.

B. DISORDERS INCLUDED—Such term includes such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.

C. DISORDERS NOT INCLUDED—Such term does not include a learning problem that is primarily the result of visual, hearing, or motor disabilities, of mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage.

Definition	Subaverage Achievement	Intra-individual Differences	Process Deficits	CNS Dysfunction	Discrepancy	Exclusion of Other Disabilities	Life-span Problem
Kirk	•	•	•	•		•	
Bateman	•	•	•	•	•	•	
NACHC	•	•	•			•	
94–142	•	•	•			•	
NJCLD	•			•			
LDA	•	•	•	•			•
IDEA	•	•	•			•	

The upper panel shows the definitions, with a label for each. The lower panel shows which components appeared in each labeled definition. Following is a brief discussion of the important aspects identified in definitions of learning disabilities:

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CEC Knowledge Check
What point is unique to the Bateman definition? How has this definition affected the identification of students with learning disabilities? CC1K1

Achievement Deficits From the beginning of interest in learning disabilities, there has been an emphasis on problems in achievement. As a hallmark of learning disabilities, achievement deficits are important, but not all students who have low achievement necessarily have learning disabilities. Some students with other disabilities, especially emotional or behavior disorders and mental retardation, have below-average achievement. However, it very unlikely that a student with above-average achievement would be identified as having a learning disability. (We discuss achievement problems in almost every chapter of this book.)

Intra-individual Differences A student may have especially marked achievement deficits in only one or in multiple areas. This aspect of learning disability distinguishes it from mental retardation, in which one would expect lowered performance across the range of academic areas. Some people regard intra-individual differences as related to ability and achievement, postulating an **ability-achievement discrepancy** (an idea discussed more fully in a subsequent section). We discuss

ability-achievement discrepancy the discrepancy between a person's potential for achievement based on intellectual ability and his or her actual achievement

intra-individual differences in many chapters, especially those having to do with eligibility and identification (Chapter 3) and the academic areas (Chapters 11 through 14).

Psychological Processing Problems The concept of psychological processes dominated discussions in the 1960s and 1970s. Early authorities in learning disabilities believed that certain deficits in how children received, organized, and expressed auditory (verbal) and visual information were closely related to their learning problems and might even be at the root of those problems. Because these deficits were hard to assess reliably and because improving children's performance on them rarely resulted in improved achievement, the idea of processes was controversial and ultimately discarded (Hallahan & Cruickshank, 1973; Mann, 1979). More recently, however, educators have come to understand that there are precursor skills for some areas of academic achievement that appear very similar to some of the psychological processes discussed in the early days of learning disabilities. For example, *phonemic awareness,* which is often considered a psychological process, is important in reading and spelling (Torgesen, 2002a). We discuss some of the modern processes of importance in the chapters about cognitive, metacognitive, and motivational problems (Chapter 8) and the academic areas (Chapters 11 through 14).

Neurological Deficits Throughout the history of learning disabilities, authorities have grappled with the idea that the behavioral problems referred to in Kirk's definition are, in fact, the consequence of minor variations in neurological functioning. The idea is appealing because we know that conditions with identifiable neurological bases, such as cerebral palsy, often are accompanied by anomalies in learning and behavior. However, until recently, scientists have not been able to measure subtle neurological differences consistently. Furthermore, were those differences actually found to cause learning disabilities, there would probably be few implications for teaching. We examine the important role of neurological deficits in learning disabilities in the chapter on causes of learning disabilities (Chapter 2).

Exclusion When the field of learning disabilities was emerging in the 1960s, there was strong pressure to distinguish it from other already-recognized disabilities. Parents and others wanted to make it clear that children's problems were not the result of other handicapping conditions. These children did not have mental retardation, emotional disturbance, cerebral palsy, or other problems. They had academic underachievement that could not be explained by other disabilities (Kavale, 2002). As a result, many definitions of learning disabilities incorporated phrasing that defined learning disability by excluding other problems. For some authorities (e.g., Henley, Ramsey, & Algozzine, 1996), a definition by exclusion was unacceptable, and this became a reason to doubt whether learning disabilities were real problems.

Life-span Problems Most early efforts in the area of learning disabilities were focused on preventing learning problems in young children, but many in the field came to recognize that even though prevention was an important goal, it was not practiced (Kauffman, 1999). Furthermore, some students' disabilities did not

Shannon

become obvious until they were older. For example, Shannon's attention problems probably were masked during her first few years of school by an absence of requirements for self-sustained attention and then, during her middle elementary years, by the fact that her teacher used highly engaging techniques of instruction so that her attention problems were mitigated. But will she have attention problems as an adult? Some accounts indicate that despite successful remedial instruction, individuals with learning disabilities continue to have problems as adults (Reiff, Gerber, & Ginsberg, 1997). In addition, some children who have no obvious problems prior to school entry turn out to have learning disabilities. We discuss the problems of individuals with learning disabilities outside of the usual K–12 schooling period in Chapters 5 and 6.

Social Relations Problems Because of the emphasis on academic problems in learning disabilities, related problems in social relations were often overlooked. As it happens, such problems often are related. Early on, Bryan (1974a, b) showed that many individuals with learning disabilities were both less popular than their peers and communicated in ways that provoked enmity from them. As a result, we have come to understand that some students with learning disabilities may lack the social graces to permit them to relate with their peers and others (Wong & Donahue, 2002). Thus, many authorities now contend that the definition of learning disabilities should include problems in social relations. We address social-emotional problems in Chapter 7 and also in Chapter 11, where we discuss verbal language problems.

Comorbidity When two problems or disabilities occur together in the same person, they are said to be *comorbid.* Given the emphasis on academic problems in learning disabilities, some might expect that learning disabilities would not overlap with other disabilities. This is not the case. Some children have disabilities in only one academic area, but others have problems in more than one area (e.g., Fuchs & Fuchs, 2002). This was the situation for Shannon when she was in elementary school, but instruction focused more strongly on correcting her problems in reading than in arithmetic. Furthermore, students with learning disabilities may have other handicapping conditions as well; this was also the case with Shannon, who had attention deficit hyperactivity disorder. Also, authorities in gifted education have discussed the potential for students with exceptional talents to have learning disabilities (Brody & Mills, 1997). The topic of comorbidity reappears in later chapters on social behavior (Chapter 7) and attention and ADHD (Chapter 9). All of these factors have affected how learning disabilities have been defined in the past and have profound influences on how learning disabilities are defined now.

Today's Definition of Learning Disability

In 2000, the U.S. Department of Education Office of Special Education Programs (OSEP) convened a group of 18 educators to reexamine the problem of defining learning disabilities with the purpose of providing a basis for future legislation. The focus of the meeting was to commission a set of papers on issues related to the

definition of learning disabilities and to plan a later meeting. The issues addressed included detailed treatments of historical perspectives, classification approaches, ability-achievement discrepancy, and other topics. In August 2001, OSEP invited authors of the papers, authors of responses to the papers, and representatives of organizations and agencies interested in learning disabilities to a meeting on learning disabilities called "Building a Foundation for the Future" (also known as the "LD Summit"). After the summit, a subgroup of researchers met and developed consensus statements about selected issues. In one of those statements, the group reaffirmed the concept of learning disabilities.

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CEC Knowledge Check
Develop your own definition of learning disabilities; include the five major points from Kirk's definition as well as other issues.
CC1S1, LD1K5

> Strong converging evidence supports the validity of the concept of specific learning disabilities (SLD). The evidence is particularly impressive because it converges across different indicators and methodologies. The central concept of SLD involves disorders of learning and cognition that are intrinsic to the individual. SLD are specific in the sense that these disorders each significantly affect a relatively narrow range of academic and performance outcomes. SLD may occur in combination with other disabling conditions, but they are not due primarily to other conditions, such as mental retardation, behavioral disturbance, lack of opportunities to learn, or primary sensory deficits. (Bradley et al., 2002, p. 792)

U.S. federal and state legislation has influenced learning disabilities in many ways, and major laws have had substantial effects on today's definition of learning disabilities (Martin, Martin, & Terman, 1996). Table 1.2 shows many of the major laws and their relation to the definition of learning disabilities. As shown in the table, in 2003–2004 the U.S. Congress debated the fundamental law governing special education. Congress considered leaving the formal definition essentially unchanged. However, Congress proposed that the U.S. Department of Education Office of Special Education and Rehabilitative Services (OSERS) test alternative ways to identify students with learning disabilities. The legislators proposed this action because of intense controversy over the issue about whether a discrepancy between children's ability and their achievement is an appropriate basis for deciding if a student should receive special education services.

Discrepancy between Ability and Achievement Is Controversial

Given the historical importance of unexpected underachievement in defining learning disabilities, it may seem surprising that there is controversy about the concept of a discrepancy between ability and achievement and the use of such discrepancy in identifying who is eligible for special education (Hallahan & Mercer, 2002; Kavale, 2002). However, the topic has been widely discussed, especially since the 1980s.

Concerns about the Concept of Discrepancy

Researchers have pointed to at least four problems inherent in the ability-achievement discrepancy concept. First, the concept of ability, as measured by intelligence tests, is fraught with problems. Disputes regarding the definition and measurement

TABLE 1.2 Legislative Milestones Affecting Learning Disabilities

YEAR	LAW	NAME	FEATURES
1975	PL 94-142	Education for All Handicapped Children Act	Mandated a free, appropriate public education (FAPE) for all children, including those with learning disabilities; provided for Individual Education Plans (IEPs); ensured due process rights; provided a funding mechanism.
1983	PL 98-199	Education of the Handicapped Act (amendments)	Reauthorized the act, changing its name slightly, and established special projects in transition to work, early childhood, and support of parents.
1986	PL 99-457	Education of the Handicapped Act (amendments)	Extended the time for early intervention, making special education services available to preschoolers.
1990	PL 101-476	Individuals with Disabilities Education Act (IDEA)	Amended EHA and changed its name. Also required that assistive technology and transition plans be part of educational plans and added other areas of disability to the list of those recognized by the U.S. federal government.
1992	PL 102-119	Individuals with Disabilities Education Act (amendments)	Reauthorized the law and placed even greater emphasis on early intervention for preschool children.
1997	PL 105-17	IDEA Amendments of 1997	Reauthorized the law and increased influence of parents.
2004	pending	Improving Education Results for Children with Disabilities Act	Allow determination of eligibility through mechanisms such as response to scientific, research-based intervention. Require that IEPs contain statements of measurable annual goals and how progress toward them will be measured rather than benchmarks or short-term objectives.

of intelligence have been characteristic of the field since Alfred Binet constructed the first IQ test at the beginning of the 20th century. Issues surrounding the concept of intelligence have increased in intensity over the years. As one researcher put it, "The decision to base the definition of a reading disability on a discrepancy with measured IQ is . . . nothing short of astounding. Certainly one would be hard-pressed to find a concept more controversial than intelligence in all of psychology" (Stanovich, 1989, p. 487). And as others have stated:

> It seems unfortunate that the LD field has placed so much emphasis on intelligence in attempting to define LD. The concept of intelligence, itself, is fraught with difficulties, and they become magnified when applied to LD. Intelligence is not as fundamental to LD as has been believed. The LD concept needs to be examined in its own right, not built on another extant, but shaky, concept. Despite its longer history, and the comfort of its familiarity, intelligence is a relatively minor player in the complex

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CEC Knowledge Check

What do you think is the most important federal special education law? Why?
LD1K3, LD1K4

amalgam of what is termed *LD.* It seems appropriate that the alliance be broken and the LD field begin to seek its own identity. (Kavale & Forness, 1995a, p. 186)

One of the problems with intelligence tests (and many achievement tests, too) is that they focus on the end product of learning (Meltzer, 1994). These tests provide a score but provide little information on what processes and strategies the individual taking the test used or did not use to arrive at that score. Some students may get the right answer for the wrong reason—they follow a mistaken rule that accidentally leads to the correct answer.

Second, some researchers have pointed out that the intelligence of students with learning disabilities may be underestimated by IQ tests because, to a certain extent, IQ depends on achievement (Siegel, 1989; Stanovich, 1989). In part, intelligence tests assess what a person has learned in comparison to what others have learned by a similar age. If IQ is used when determining a discrepancy, then one is basically comparing one form of achievement test to another form of achievement test.

Matthew effect the idea that the rich get richer while the poor get poorer; for example, in reading, students who develop reading skills early will have an advantage in learning about the world and will, therefore, do better on tests of intelligence

Most people have come to accept the idea of a **Matthew effect.** A Matthew effect refers to the idea of the rich getting richer and the poor getting poorer. Those who know more are able to learn more in the future. (It is derived from Matthew XXV:29 in the Bible: "For unto every one that hath shall be given, and he shall have abundance; but from him that hath not shall be taken away even that which he hath.") With reference to intelligence, a Matthew effect dictates that students who are better readers will have a better chance to learn from what they read than will poor readers, because better readers will not be laboring with the decoding aspects of reading. They will have more time to expand their vocabularies and comprehend more complex concepts, which will result in their better performance on intelligence tests (Stanovich, 1986). The implication for learning disabilities is that the poor reading skills of children with disabilities may lead to poorer performance on intelligence tests; their resulting lower IQs will reduce the discrepancy between IQ and achievement, making it more difficult for them to qualify as having a learning disability.

Third, discrepancies between IQ and achievement, once considered a hallmark of learning disabilities, may not reliably discriminate among students identified as having learning disabilities and similar students who have not been identified as having learning disabilities (Fletcher et al., 2002). Comparisons of students with discrepancies between IQ and achievement (i.e., average IQ and low achievement in reading) and those poor readers who do not have discrepant achievement and IQ (i.e., lower IQ and low achievement in reading) show that they lack similar skills in early reading. Both groups need to learn the same skills (discussed in Chapter 12), regardless of whether they had IQ-achievement discrepancies (Fletcher, Francis, Rourke, Shaywitz, & Shaywitz, 1992; Fletcher et al., 1994; Fletcher et al., 2002; Pennington, Gilger, Olson, & DeFries, 1992; Stanovich & Siegel, 1994). At best, results comparing the two groups are mixed. Furthermore, research on one of the most important skills for learning to read—phonemic awareness (see Chapter 12)—has found the two groups to be more similar than different (Stanovich & Siegel, 1994).

Fourth, using a discrepancy makes it difficult to identify students in the early grades as having a learning disability, because they are not yet old enough to have

demonstrated a discrepancy (Kavale, 2002; Mather & Roberts, 1994; Sawyer & Bernstein, 2002). Some authorities in learning disabilities call this a "wait-to-fail model," because children must suffer through months or even years of problems before they can be found eligible for special education. In the first grade, for example, the average child has only begun to master the rudiments of reading and math. In the case of a first-grader such as Jamal, who is smart but has academic problems, the problems may be obvious. But for children who have average or even slightly below-average IQs, the narrow range between where they should be and where they actually are functioning makes it difficult to establish a discrepancy. Some teachers are concerned that even when they are sure a student has a learning disability, they must wait until the next year for the child to score low enough in achievement.

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CEC Knowledge Check

How have theoretical objections of discrepancy contributed to the formation of special education and to issues in the field, especially nondiscriminatory referral and assessment? CC1K1, CC1K6, LD1K1, LD1K2, LD1K4

Concerns about the Methods for Establishing a Discrepancy

Professionals have used various methods to determine a discrepancy between ability and achievement. For many years, they used a very simple method of comparing the mental age obtained from an IQ test to the grade-age equivalent taken from a standardized achievement test. A difference of two years between the two test results was frequently used as an indicator of a discrepancy. This method has largely been abandoned because, for one thing, there are statistical problems in computing grade-equivalent scores. Furthermore, two years below grade level is not an equally serious discrepancy at every grade level. For example, a child who tests two years below grade 8 has a less severe deficit than one who tests two years below grade 4.

As an alternative, some local education agencies (LEAs) compare standard scores. Standard scores have a mean of 100 and a standard deviation of 15, so a standard score of 85 would be one standard deviation below the average. Most IQs are standard scores, and most achievement tests yield a standard score, too. So, for example, if an LEA's rules say that to be identified as having a learning disability, there must be a discrepancy of 22 standard score points, then a student with an IQ of 103 would have to have a standard score of 81 in some area to qualify. Comparing standard scores avoids the problems of using grade equivalents but does not avoid other problems with relying on discrepancy. For example, there is no objective standard for how large a discrepancy must be to establish learning disability. Also, directly comparing standard scores still involves tying learning disability to the questionable construct of IQ.

Table 1.3 (page 22) shows selected scores for Jamal and Shannon. Shannon's full-scale IQ (FSIQ—the measure usually used in comparing standard scores) of 94 may not qualify her for services when compared to her score of 83 in math, her lowest area of achievement. Jamal's FSIQ is high enough that his reading score would be considered discrepant by many LEAs.

Jamal

Shannon

Beginning in the late 1970s and early 1980s, many state education agencies (SEAs) and LEAs began to adopt different formulas for identifying IQ-achievement discrepancies. Most of the early formulas were statistically flawed, however. They did not take into account the strong statistical relationship between tested IQ and tested achievement. The U.S. federal government even proposed a formula in the

TABLE 1.3 Examples of Scores Illustrating Ability-Achievement Discrepancy

STUDENT	IQ	LOWEST ACHIEVEMENT STANDARD SCORE (AREA)
Jamal	105	90 (reading)
Shannon	94	83 (mathematics)

rules for implementing PL 94-142, but it was immediately criticized and abandoned (Lloyd, Sabatino, Miller, & Miller, 1977). Some have advocated the use of formulas that correct for the relationship between IQ and achievement; these are referred to as *regression-based discrepancy formulas.*

Council for Exceptional Children

CEC Knowledge Check
Why do you think using discrepancy formulas can be of ethical concern?
CC8K2, CC8S6

On the surface, regression-based formulas appear objective and professional, but they have problems as well. They still use IQ, require that some arbitrary cutoff score be set, and encourage people to make what are nuanced, human decisions solely on a statistical basis. For these and other reasons, many have questioned the wisdom of using even statistically adequate formulas (Board of Trustees of the Council for Learning Disabilities, 1986).

Consensus about Discrepancy

Overall, researchers appear to have reservations, although not unanimous reservations, about the usefulness of discrepancy (Fletcher et al., 2002; Kavale, 2002; Speece & Shekitka, 2002, Scruggs & Mastropieri, 2002). Even when OSEP convened the LD Summit to reexamine the problem of defining learning disabilities, the issue of discrepancy was the one area on which there was a divided opinion among the experts.

> Today there is considerable disagreement among practitioners and researchers alike on the usefulness of the discrepancy approach. Although many IDEA stakeholders in the field reject the use of the discrepancy approach because it does not identify the students they believe are in most need of services, many others continue to depend on psychometric tests as a way of corroborating their clinical judgment. The majority of researchers [attending the consensus meeting] agreed that use of IQ tests is neither necessary nor sufficient as a means of classifying students with SLD. However, a minority viewpoint cautioned that the field of SLD could be compromised by eliminating the discrepancy approach because it may be an appropriate marker for unexpected underachievement, which is one measure of SLD. (Bradley et al., 2002, p. 797)

The concept of discrepancy has provided a foundation for learning disabilities throughout most of the brief history of the area of study, and given its historical place in the fabric of learning disabilities, discrepancy will always be a part of the concept of learning disability. Although it does not formally appear in recent or current definitions of learning disabilities, the concept of discrepancy is still familiar

and intuitively sensible to many teachers of students who need special education services. The idea of unexpected underachievement serves to distinguish learning disabilities from mental retardation. For these reasons, it is likely that the concept of discrepancy will continue to be associated with learning disabilities.

Criteria Used to Determine Eligibility for Special Education Vary

The criteria used in determining eligibility for special education are perhaps more important than the definition itself. Formal definitions are often the work of scholars and thus may be more academic and less applicable than definitions needed by practitioners. Practitioners, in contrast, apply rules, guidelines, criteria, and definitions flexibly so that they can meet the needs of individual students or the policies of their agencies.

The majority of states use a definition based on the U.S. federal definition. Though the definition does not explicitly mandate use of discrepancy, states have historically adopted criteria that refer to an ability-achievement discrepancy (Mercer, Jordan, Allsopp, & Mercer, 1996). In the United States, because education is primarily a function of state governments rather than the federal government, rules developed by state educational agencies are usually implemented by local education agencies. To be sure, state rules often are based on federal rules, allowing states to receive federal funds, but states can write their own criteria for determining eligibility.

The exact mechanisms used for identification have varied from state to state and are often quite detailed. To illustrate, Iowa published a 52-page, single-spaced document describing procedures to be used in determining eligibility (Learning Disability Study Group, 1997). Wisconsin provided explicit directions for computing a grade score to be used in determining whether a severe discrepancy exits (Wisconsin Department of Public Instruction, 2002). With the changes in U.S. laws, these mechanisms will be in flux for several years after 2004.

Researchers have examined the way that state and local educational agencies determine whether students are eligible for special education because of learning disabilities. A teacher's decision to refer a student for eligibility assessment—as Ms. Hamilton referred Jamal—is a critical step in the process (Gerber & Semmel, 1984; Ysseldyke, Algozzine, & Epps, 1983; Zigmond, 1993). When a general education teacher considers a student hard to teach, this makes it clear that there is a problem.

Jamal

Teachers usually attempt to solve learning problems prior to recommending a formal evaluation for eligibility. Jamal's teacher informally tested alternative methods to address his problems with important prereading skills. ("We've already tried some things," Ms. Hamilton told Mrs. Smith. "We gave him extra reading time and some special attention, but that hasn't taken care of things. He still didn't take off.") If the general education teacher has already tried prereferral interventions, the probability of a disability becomes even greater.

When instruction usually available in general education classrooms is not sufficient and simple supplements have not solved learning problems, schools often use more formal ways of addressing the situation. Since at least the late 1970s, schools have sought ways of serving students with learning disabilities without having to

identify them as needing special services, often by providing special interventions prior to beginning the referral that leads to evaluation and then to a decision about eligibility (e.g., Chalfant, Pysh, & Moultrie, 1979). The concept of intervening prior to referral appeals to many. When it works, it provides a simple solution to problems, builds competence in general education, prevents a student from being labeled as having a disability, and reduces expenses for evaluation and special education.

Council for Exceptional Children

CEC Knowledge Check
What relationship exits between special education and the organization and function of educational agencies? CC1K3, LD1K1, LD1K2

Over the years, efforts to intervene early have been known by different terms: *child-study team, consultative teacher model, prereferral intervention, teacher assistance team.* These approaches presume that lesser learning problems can be differentiated from learning disabilities by making adjustments in the general education environment. In the late 1990s and early 2000s, updated versions of these approaches were discussed extensively by authorities in learning disabilities (Gresham, 2002; Fuchs & Fuchs, 1998; McNamara & Hollinger, 1997, 2002; Marston, 2002; Sheridan, Welch, & Orme, 1996; Thomas & Grimes, 1995; Vaughn & Fuchs, 2003). When it considered excusing schools from using discrepancy in determining eligibility, the U.S. Congress recommended more extensive study of an even more formal method of prereferral intervention called "responsiveness to intervention."

Responsiveness to Intervention

There are two broad approaches that authorities in learning disabilities have discussed under the label of *responsiveness to intervention* (or responsiveness to treatment) (Fuchs, Mock, Morgan, & Young, 2002). One of these approaches emphasizes a consultation process in which teams of educators collaborate to identify ways of solving problems experienced by individual children (e.g., Gresham, 2002). The plans these teams develop are implemented and monitored, and if these plans do not work, then students are evaluated for eligibility for special education. The second approach emphasizes provision of a standard curriculum, with supplemental instruction for students who do not respond to the main curriculum. For students who still struggle after receiving supplemental instruction, referral for special education evaluation is the next stage, with the possibility that these students will be found eligible. Although we return to the details of such administrative plans in Chapter 3 on eligibility, we illustrate them here to help explain some of the controversies in learning disabilities.

Behavioral Consultation The first approach—*behavioral consultation*—draws heavily on approaches that have been advocated since the 1970s (e.g., Chalfant et al., 1979; Heron & Catera, 1980) and for which preliminary research support was weak (Lloyd, Cawley, Kohler, & Strain, 1988). In these approaches, schools (1) identify students who are struggling, (2) provide different degrees of specialized instruction within the education situation, and (3) monitor these students' progress before and after they receive specialized instruction. If specialized instruction works (based on comparison of progress before and after the onset of that instruction), then these students continue to receive instruction under the general educational model prevailing in their school. If that instruction does not work, then the school may develop a new plan for even more specialized instruction or may initiate evaluation for special education. Some advocates of this approach place greater emphasis on form-

ing consultative relationships among general and special educators, but others place more emphasis on modifications of curricula and instruction (Gresham, 2002; McNamara & Hollinger, 1997; Sheridan, Eagle, Cowan, & Mickelson, 2001).

Advocates of the behavioral consultation approach contend that it permits delivery of instruction that is expressly tailored to students' needs but does not require that they be labeled as having learning disabilities. One of the foundations of this approach is assessing students' performance on tasks closely related to the curriculum and assessing it frequently and objectively—a method frequently called *curriculum-based assessment* or *curriculum-based measurement;* curriculum-based measurement has well-documented advantages (Fuchs & Fuchs, 1986). According to advocates, another advantage is that only those students who do not respond to treatment after one or more specialized interventions are evaluated for eligibility, with the result that fewer students are identified as having learning disabilities and thus more are spared the possible stigma of having a label. Advocates also suggest that officially designating fewer students as having learning disabilities will save money (see McNamara & Hollinger, 1997; Sheridan et al., 2002).

Council for Exceptional Children

CEC Knowledge Check
What are the positive aspects of using the behavioral consultation model for responsiveness to intervention?
LD1K3, LD1K4, LD1K5

Standardized Protocol Whereas the behavioral consultation approach addresses problems across the academic domains and the age span, the second approach—standardizing the protocol or curriculum—operates more from a preventive stance, emphasizing early reading performance. Advocates of a *standardized protocol* are especially concerned about whether young children who have problems in important areas such as phonological processing (the kinds of problems that Jamal was experiencing) might be easily helped before their problems develop into more substantial deficits that can be labeled dyslexia. By the time this happens and they are then eligible for special education services, these students may be too old to have their problems corrected in a timely fashion.

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CEC Knowledge Check
What are the positive aspects of using the standardized protocol model for responsiveness to intervention?
LD1K3, LD1K4, LD1K5

As do their colleagues who support a behavioral consultation model, supporters of the standardized curriculum approach recommend that special education not be provided until after students have fallen through a cascade of less restrictive alternatives. This approach requires that schools adopt curricula that are documented as very effective. A key feature of laws passed in the United States in the early 2000s (for example, "No Child Left Behind" and "Improving Education Results for Children with Disabilities") is that they emphasized "scientifically based reading" instruction. To receive federal funding, state and local education agencies needed to show that kindergarten through third-grade teachers had available and knew how to use curricula that had documented effectiveness and that they would receive help in how to adapt materials and methods to meet the instructional needs of students who were not making adequate progress. Ideally, schools would put into operation the most effective curricula they could find. They would provide a safety net composed of more intensive and supplemental help on specific skills in early reading for those who did not benefit from the main curriculum. For those who continued to fail, there would be the option of special education evaluation.

Council for Exceptional Children

CEC Knowledge Check
What is the main criticism of the standardized protocol model?
LD1K3, LD1K4, LD1K5

Critics of the standard curriculum approach have pointed out that it is also a wait-to-fail model. Because some students' problems may be obvious early in their school years, it may be better to establish eligibility right away for them. Jamal's

general education teacher thought this was true for Jamal, but as you will see in Chapter 3, other school personnel were reluctant to identify him as having a learning disability. Delays raise the chance of continued failure, exacerbating the problems students have. The International Dyslexia Association noted, "Using response-to-instruction as the criterion for identification is hazardous because it may prolong the process of identification and deny needed services to children who are clearly at risk" (Dickman, Hennesy, Moats, Rooney, & Toomey, 2002, p. 17).

The jury is still out about how useful response-to-treatment approaches will prove to be. Whereas these methods have great appeal, we need to know more about their promises and pitfalls (Vaughn & Fuchs, 2003a). Will students who receive these treatments no longer require special assistance? Will many still need later special education? How many will be helped? How many will still require special education? For those who do, will the delay in eligibility be detrimental? These are questions that researchers will study over the next few years.

Eligibility in Practice

Jamal

Shannon

When a team of professionals meets to decide whether an individual is eligible for special education, the members examine assessment data and reports (such as those for Jamal and Shannon, provided on the Website) to inform their judgment. The team also examines why prereferral interventions that have been used may not have been successful. Research has consistently shown that the procedures used by these teams vary from place to place, are sometimes inconsistent with rules and regulations, and often result in the identification of students as learning disabled who have such low IQs (below 75 and even below 60) that they might reasonably have been considered to have mild or moderate mental retardation (Bocian, Beebe, MacMillan, & Gresham, 1999; Gottlieb, Alter, Gottlieb, & Wishner, 1994; MacMillan, Gresham, Siperstein, & Bocian, 1996; Schrag, 2000).

Evidence such as this has led authorities to question whether the issue of definition is as important as the issue of consistency in criteria used to determine eligibility (MacMillan & Siperstein, 2002; Scruggs & Mastropieri, 2002). Sadly, such questions often become an indictment of practitioners. Educators should not assume that inconsistencies between academic models and practice mean that the practice is wrong and the models are right. The factors that influence the decisions of these different groups are not the same, so we should expect some discrepancy between them (Gerber, 2000).

Another reason for the inconsistencies in definitions of learning disabilities used by researchers and practitioners is that the two groups have different purposes in defining the phenomenon (Lloyd, Hallahan, & Kauffman, 1980; MacMillan & Speece, 1999). Although researchers seek clarity and consistency, teachers and others are confronted with murky and irregular phenomena that demand immediate resolution and do not fall into neat categories.

> The science and practice of learning disabilities appear to be headed in two different directions. Schools serve children as LD who exhibit extremely low achievement and do not necessarily meet IQ-achievement discrepancy standards. Researchers may use sample selection procedures that bear no resemblance to the children served by the

> schools, or depend on school-identified samples that vary in unknown ways. In either case, the results of research studies employing either approach to samples have limited external validity for practitioners. (MacMillan & Speece, 1999, pp. 124–125)

Because of changes in U.S. laws, state and local education agencies are revising their procedures for identifying students as having learning disabilities. Some agencies may have adopted more formal response-to-treatment systems, some may continue to use ability-achievement discrepancy methods, and some may depend on the clinical judgment of the members of an eligibility team. Whatever system is in place, it is important for teachers to proceed carefully.

Given all the false starts and contention in learning disabilities, it should be no surprise that problems in the criteria for determining who is eligible for special education because of learning disabilities have led some people to criticize learning disabilities as a manufactured crisis, an illusion. According to this view, learning disabilities is a social construct, a consequence of our social system.

Learning Disability as a Construct

Many critics have asked whether learning disabilities is a real phenomenon or whether it is instead socially constructed, an outgrowth of the demands, perceptions, values, and judgments of those who are involved with these students (Carrier, 1986; Coles, 1987; Finlan, 1994). One view is that students with learning disabilities are different from most people in ways that are relatively constant across social contexts. In this view, the assumption is that the primary causes of learning disabilities are biological, or neurological. We examine neurological and other possible causes of learning disability in Chapter 2. Another view is that learning disabilities are largely created by social demands and expectations—in other words, constructed by social contexts. In this view the assumption is that the primary causes of learning disabilities are social circumstances, including the demands of schooling and employment.

Few would suggest that the problems we call learning disabilities are entirely a function of either neurological dysfunction or environmental structure and expectations. Virtually all would acknowledge that learning disability is a concept constructed in the social context of the expectations and demands of school, employment, and other aspects of community life and that this concept serves important social and political purposes.

In an extreme view, the act of testing or measuring students' performance brings into existence the problem of learning disabilities. If we did not measure students' performance in such areas as spelling, we would never have to confront the fact that some students spell more accurately—and thus obtain higher scores—than others. If we did not know that some had especially low scores, we would never need to provide them remedial help. Further, if we did not set cutoff points on measures of performance, we would not have to designate students who need help, who have learning disabilities.

People differ substantially in their attitudes about the social criteria chosen for defining learning disabilities. Some think that because the criteria for the definitions

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CEC Knowledge Check
How do critics of the learning disabilities field attempt to discredit the labeling of students with learning difficulties?
CC1K1

are arbitrary and can be changed at will, the social construction of the category is indefensible. Others point out that the arbitrary nature of the criteria by which many categories (e.g., citizen, person of voting age, poor, at-risk) are socially constructed cannot be avoided (Kauffman, 1989).

The fact that social and cultural expectations and purposes help shape the definition of learning disabilities has led some to see learning disabilities as an "imaginary disease" (Finlan, 1994) or as a category designed to maintain school programs stratified by race and class (e.g., Sleeter, 1986; see Kavale & Forness, 1987a, for a critique). Although acknowledging that social and political forces are important in defining learning disabilities, others see the social construction of this special education category as overwhelmingly beneficial to the children who are identified, because they can receive important special services with minimal stigma (e.g., Kavale & Forness, 1985; Moats & Lyon, 1993; Singer, 1988; Singer & Butler, 1987). As Moats and Lyon noted, "LD in the United States appears to be a systemic problem: It is an educational category into which children are channeled when the learning-teaching interaction is no longer productive or rewarding for one or both parties" (1993, p. 284). Still others argue that using teacher requests for help with a specific child as the criteria for the need for special education is both reasonable and humane (e.g., Gerber & Semmel, 1984). No doubt controversy will continue to surround the question of how much learning disabilities are a function of social demands and expectations and the social, political, and educational interests that are at play.

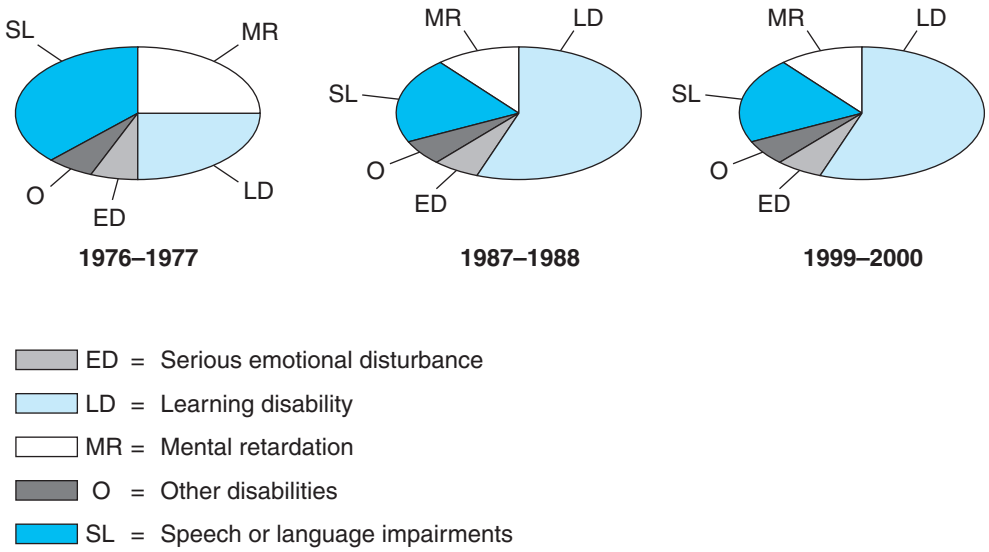
How Many People Have Learning Disabilities?

According to the most recent reports by the U.S. federal government, public schools have identified nearly three million (2,887,217) students ages 6 through 21 as having learning disabilities. Approximately 5.5% of students in the school years (ages 6 to 17) need special education due to learning disabilities (U.S. Department of Education, 2002b). Actually, this percentage is likely a slight underestimate of all cases of learning disabilities, because the numerator consists of the number of students identified by public schools, whereas the denominator includes all persons in the United States, including those in private schools. Because there are undoubtedly students in private schools who have learning disabilities but are not identified as such by the public schools, we can assume that the number in the numerator does not represent all students with learning disabilities.

Since 1976/1977, when the federal government started keeping data on students served in special education, the number of students ages 6 to 21 years identified as having learning disabilities has more than tripled. In addition, those with learning disabilities now represent over half of all students identified as disabled. Figure 1.2 shows the phenomenal growth in the proportion of students with learning disabilities relative to all students with disabilities.

Many authorities have expressed alarm at the rapid growth of students identified as having learning disabilities. Critics claim that learning disabilities is an ill-defined category and includes many students who only need better instruction from

FIGURE 1.2 Proportion of Students with Learning Disabilities to Students with Disabilities



Source: Data from U.S. Department of Education, 2003. Available online at http://www.ed.gov/about/reports/annual/oesp/

general education teachers (Algozzine & Ysseldyke, 1983; Lyon et al., 2001). Even defenders are concerned that much of this growth is unwarranted and indicative of confusion over definition and diagnostic criteria, especially within the area of mental retardation (Macmillan, Siperstein, & Gresham, 1996). They fear that many children are being misdiagnosed and that the resulting increase in those identified as learning disabled has provided ammunition for critics, thereby jeopardizing services for students who do need help.

Some researchers have indicated that the fact that it is virtually impossible to differentiate between low-achieving students and those classified as having learning disabilities shows that the definition is too loose (e.g., Algozzine & Ysseldyke, 1983; Ysseldyke, Algozzine, Shinn, & McGue, 1982). Others have analyzed the same data and concluded that this is a serious misstatement (Kavale, Fuchs, & Scruggs, 1994). They point out that much of the critics' case is based on the idea that the ability-achievement discrepancy should be used as the most important criterion for classification as learning disabled.

Although it is logical to suspect misdiagnosis as the main cause of the growth of learning disabilities, there is a paucity of research support. Some have noted that the increase in learning disabilities has occurred in almost direct proportion to the decrease in the number of students identified as mentally retarded (Macmillan et al., 1996; see Figure 1.2). These researchers have hypothesized that political and social forces have led to a greater reluctance to identify children as mentally retarded; those children who would formerly have been so labeled are now identified

as learning disabled. Helping to bring about this shift in diagnosis was the American Association on Mental Retardation's 1973 decision to change its definition of mental retardation to include an IQ cutoff of about 70 to 75 rather than 85.

Not all professionals consider the increase in prevalence unwarranted. There may be valid reasons for some of the growth (Hallahan, 1992). First, because the field of learning disabilities was relatively new when the federal government started keeping prevalence data in 1976, it may have taken professionals a few years to decide how to place children in this new category. Second, the social-cultural changes that have occurred since 1968 may have heightened children's vulnerability to developing learning disabilities. For example, an increase in poverty has placed more children at risk for biomedical problems, including central nervous system dysfunction (Baumeister, Kupstas, & Klindworth, 1990).

Social and cultural risks exist in addition to biological risks. Families, whether or not in poverty, are experiencing greater degrees of psychological stress. For example, a study of leisure arrived at the following conclusions:

> Americans are starved for time. Since 1969, the annual hours of work of employed Americans have risen markedly—by approximately 140 hours, or more than an additional three weeks. This increase includes both hours on the job and time spent working at home. As a result, leisure, or free time, has declined as well. Increasing numbers of people are finding themselves overworked, stressed out, and heavily taxed by the joint demands of work and family life. (Leete-Guy & Schor, 1992, p. 1)

Stress on parents may result in their being less able to provide the social support necessary to help their children, who themselves are living under an increasing amount of stress. The result may be that children who in a previous time would have gotten by in their schoolwork with a less stressful lifestyle and more support are now experiencing failure.

In addition to the rapid growth in the percentage of students identified as having learning disabilities, there is substantial variation from jurisdiction to jurisdiction in the percentage of students so identified. For example, as shown in Figure 1.3, some states identify about 2% of their students but others identify over 9% of their students as having learning disabilities. One explanation for this variation is that states and localities use different criteria for determining eligibility. Another explanation is that the variation may reflect true differences based, perhaps, on differences in risk factors (environmental toxins, socio-economic status) or quality of preventative services available to families and schools. Probably neither explanation fully accounts for the differences; both factors in combination with other explanations probably are responsible.

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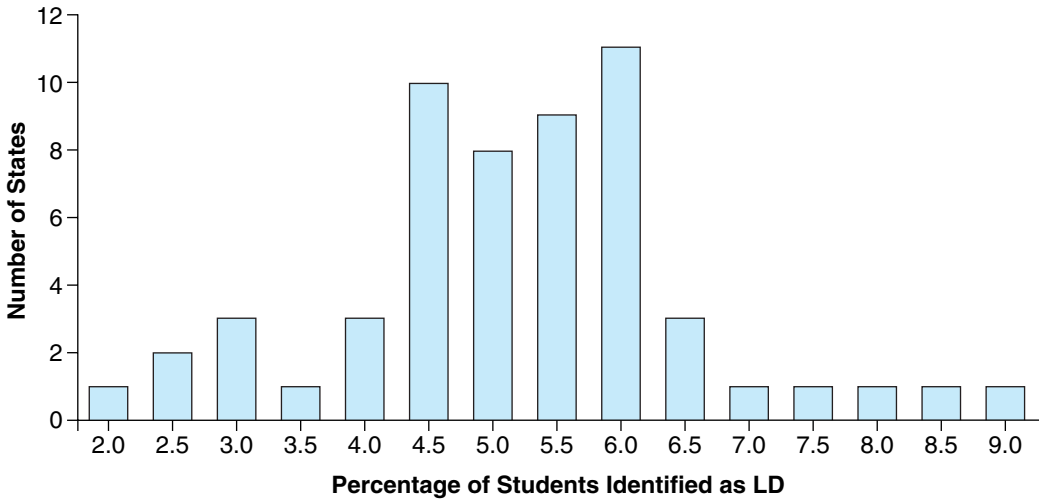
CEC Knowledge Check
What factors have caused an increase in the number of students with learning disabilities over the last 30 years? CC1K1, CC1K3

Both the growth and variation in the percentage of students identified as having learning disabilities have given fuel to the controversial nature of learning disabilities as an educational category. Another factor that has caused concern is the possibility that some groups—particularly males and children of African American heritage—may be overrepresented among the children identified as having learning disabilities.

FIGURE 1.3 Percentage of Students Identified as Learning Disabled by State



Note: Includes other governmental units such as the District of Columbia.

Source: Data from U.S. Department of Education, 2003. Available online at http://www.ed.gov/about/reports/annual/oesp/

Demographics of People with Learning Disabilities

Learning disabilities occur across a wide spectrum of the population—among people of both genders, all ethnic groups, young and old, rich and poor, the socially prominent and the obscure, the socially successful and unsuccessful, those who are admired and those who are reviled, and among those of nearly every conceivable category of human being. As we have already discussed, individuals with learning disabilities are also a very diverse group in terms of the types and degrees of abilities and disabilities they have.

A persistent question about the diversity of students identified as having learning disabilities is whether certain groups are disproportionately represented. For example, are certain groups—students of color, those who are poor, or those of some other group—over- or underrepresented in the population of students with learning disabilities? Likewise, are students of one gender more likely to be identified as learning disabled? And if there is disproportionate representation by ethnicity or gender, is this due to bias or discrimination, or are there reasonable explanations for the disproportionate representation? These questions are not trivial, for if disproportional representation is found to be the result of reprehensible practices that reflect bias or discrimination, then students are being mistreated, and these practices must be corrected. However, if disproportional representation is due to causal factors external to the school, such as poverty and its attendant disadvantages (in the case of ethnic disproportionality) or biological causes (in the case of gender disproportionality), then insisting on strictly proportional representation would be

discriminatory in that it would deny appropriate services to students who would otherwise be qualified to receive them, which is another form of mistreatment (see Hallahan & Kauffman, 2003, for further discussion).

Ethnicity

Educators in the United States do not have conclusive evidence about whether there is disproportional representation of ethnic groups among students with learning disabilities. Whereas there is strong evidence of overrepresentation of African American students in other categories of special education (e.g., mental retardation), the evidence of overrepresentation of certain groups is not strong in learning disabilities (Donovan & Cross, 2002; MacMillan & Reschly, 1998; Oswald, Coutinho, Best, & Singh, 1999). A U.S. government report showed roughly equivalent representation of African Americans and Hispanics in the learning disabilities category. This survey found that the prevalence of learning disabilities in white students, African American students, and Hispanic students was 5.3%, 5.8%, and 5.3%, respectively (U.S. Department of Education, 1996). More recently, the President's Commission on Excellence in Special Education (2002) found no clear evidence for overrepresentation of students from minority groups among those who have learning disabilities. Although U.S. society's concerns often reflect greater concern about other ethnic groups, it is important to note that there is evidence suggesting that Native Americans may be overrepresented in learning disabilities (Donovan & Cross, 2002).

The U.S. federal government provides data about the ethnicity of children receiving special education services. Table 1.4 shows the proportion of children of various ethnic groups according to type of disability. Using for comparison the overall percentage shown in the right-most column, the proportions of children from different ethnic groups who are identified as learning disabled are close to what one would expect. However the proportion of Hispanic children who are identified as learning disabled is about 10% higher than expected.

If educators found clear overrepresentation of some ethnic groups and underrepresentation of other ethnic groups in learning disabilities, they would surely want to know why this occurred. This was the issue examined in an earlier report by the U.S. government on ethnic representation in special education:

Council for Exceptional Children

CEC Knowledge Check
What are the definition and identification issues in the field of learning disabilities for individuals from culturally diverse backgrounds? CC1K5

> Some have argued that racial discrimination is the culprit. Others have pointed out that professionals, such as school psychologists, are inadequately prepared to assess the capabilities of minority students. These may indeed be factors, but why would Hispanic students be underrepresented in the learning disability category? Furthermore, if racial bias were the sole explanation, how could it account for the fact that African Americans are also overrepresented in categories such as visual impairment and hearing impairment? "[I]t is possible that black youth were more likely than their white counterparts to have experienced poor prenatal, perinatal, or postnatal health care and early childhood nutrition which may have resulted in actual disabilities" (U.S. Department of Education, 1992, p. 15).

Determining whether there is disproportional representation of various ethnic groups among students with learning disabilities is related to the matter of identifi-

TABLE 1.4 Percentage of Students Ages 6 through 21 Served under IDEA by Disability and Race/Ethnicity, during the 2000–2001 School Year

DISABILITY	AMERICAN INDIAN/ ALASKA NATIVE	ASIAN/ PACIFIC ISLANDER	BLACK (NON-HISPANIC)	HISPANIC	WHITE (NON-HISPANIC)	ALL STUDENTS SERVED
Specific learning disabilities	56.3	43.2	45.2	60.3	48.9	50.0
Speech or language impairments	17.1	25.2	15.1	17.3	20.8	18.9
Mental retardation	8.5	10.1	18.9	8.6	9.3	10.6
Emotional disturbance	7.5	5.3	10.7	4.5	8.0	8.2
Multiple disabilities	2.5	2.3	1.9	1.8	1.8	2.1
Hearing impairments	1.1	2.9	1.0	1.5	1.2	1.2
Orthopedic impairments	0.8	2.0	0.9	1.4	1.4	1.3
Other health impairments	4.1	3.9	3.7	2.8	5.9	5.1
Visual impairments	0.4	0.8	0.4	0.5	0.5	0.4
Autism	0.6	3.4	1.2	0.9	1.4	1.4
Deaf-blindness	0.0	0.0	0.0	0.0	0.0	0.0
Traumatic brain injury	0.3	0.3	0.2	0.2	0.3	0.3
Developmental delay	0.7	0.6	0.7	0.2	0.6	0.5
All disabilities	100.0	100.0	100.0	100.0	100.0	100.0

Note: Does not include data for New York State

Source: U.S. Department of Education. (2002b) *Twenty-Fourth Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act.* Washington, DC: U.S. Department of Education, Office of Special Education Programs. Page II-22

cation of students as having learning disabilities. One might suspect that changing the criteria for eligibility might alter the ratio of students from different ethnic groups who are identified, but changes in the criteria for eligibility apparently do not equalize the proportion of white and African American students identified (Colarusso, Keel, & Dangel, 2001).

Even though students from different ethnic groups may not be disproportionaly identified as having learning disabilities, there is also the possibility that they may be treated differently within the system of special education. It might be that children with Hispanic heritage might have IEPs that are systematically different than children of African American or European American heritage. As shown in the Multicultural Considerations box on page 34, the measurement practices of school psychologists may not take into account children's ethnic backgrounds. Or, perhaps, students with learning disabilities who have one ethnic background are more likely to receive most of their schooling in the educational mainstream than other students with learning disabilities. We have only preliminary evidence on this

Council for Exceptional Children

CEC Knowledge Check
How do culturally and linguistically diverse backgrounds influence the definition and identification of learning disabilities?
CC1K5

MULTICULTURAL CONSIDERATIONS

Are School Psychologists Adequately Trained to Assess Ethnically Diverse Students?

The school psychologist often plays a critical role on the team of professionals determining the eligibility of students for special education services. Scores obtained on standardized achievement and ability tests, administered and interpreted by a school psychologist, can often make the difference between a student being identified as having a learning disability or not. Unfortunately, some school psychologists are not prepared to make valid assessments in the case of children from ethnically diverse backgrounds. For example, 83% of school psychologists surveyed described their training as less than adequate to assess culturally and linguistically diverse students (Ochoa, Rivera, & Ford, 1997).

There is additional evidence that this lack of training leaves school psychologists at a loss considering cultural and linguistic issues in their testing. Researchers asked 671 school psychologists who had conducted assessments of bilingual children and children with limited English proficiency (LEP) the following open-ended question: "As a school psychologist, what criteria/standards do you use to rule out environmental, cultural, economic disadvantaged factors when determining LD eligibility when a LEP or bilingual student displays a severe discrepancy between intelligence and achievement or between grade levels?" (Ochoa, Rivera, & Powell, 1997). The results were extremely disappointing from a multicultural perspective. Few school psychologists said they considered the length of time or the number of years the student had lived in the United States, the home language of the student, or the student's performance in comparison with other bilingual and LEP students. None took into account the educational level of the parents or the level of literacy in the home.

The open-ended nature of the questionnaire may have underestimated the actual degree to which school psychologists take into account cultural and linguistic factors when doing their assessments. Perhaps they were not able to recall all the variables they consider when interpreting their tests. If given a questionnaire listing a variety of factors, perhaps more of them would have stated that they use the factors listed. Nonetheless, it is perplexing that so few school psychologists readily identified what should be obvious mitigating cultural and linguistic factors.

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CEC Knowledge Check

What is the result of not taking cultural and linguistic factors into consideration when assessing students for eligibility? Assess your own cultural bias. Is there any possibility that you could make the same mistake when assessing students for eligibility?
CC1K5, CC1K8, CC1K10, CC9K1

matter, and it indicates that although there are clear patterns showing that some students receive special education in more restrictive settings than other students, the pattern has to do with other variables (e.g., how substantial children's problems are), not with the children's ethnic background (Hosp & Reschly, 2002).

Gender

Since the earliest days of the field of learning disabilities, researchers and practitioners have noted a disproportionate number of boys identified as having learning disabilities. Some studies have found that boys so identified outnumber girls by about 3 or 4 to 1. Data collected by the federal government are only for ages 13 to 21 years, but they are essentially in agreement with other studies in finding that 73% of students identified as having learning disabilities are males (U.S. Department of Education, 1992). However, recent data from the Special Education Elementary Longitudinal Study show that in first through eighth grade, boys outnumber girls about 2 to 1 in learning disabilities (Wagner, Marder, Blackorby, & Cardoso, 2002).

The evidence showing overrepresentation of boys has prompted authorities to seek explanations for the apparent difference. Some authorities have pointed to the possibility of greater biological vulnerability for boys as an explanation for this gender difference. Boys are at greater risk than girls for a variety of biological abnormalities, and their infant mortality rate is higher than that of girls.

Other authorities have raised the issue of possible bias in referral and assessment procedures, suggesting that boys might be more likely to be referred because they are more likely to exhibit behaviors that are bothersome to teachers, such as hyperactivity. Research results on gender bias are mixed. One team of investigators found no evidence of gender bias (Clarizio & Phillips, 1986). But researchers in two other studies concluded that their data showed a bias toward identifying more males as having learning disabilities (Leinhardt, Seewald, & Zigmond, 1982; Shaywitz, Shaywitz, Fletcher, & Escobar, 1990). However, more boys than girls are identified as having disabilities even among infants and toddlers and across most categories of disabilities, so the high proportion of boys among students with learning disabilities cannot be solely the result of bias in identification (Hebbeler et al., 2001; Wagner et al., 2002).

Shaywitz et al. (1990) compared a sample of students identified by schools as reading disabled to an epidemiological sample on the discrepancies between IQ and reading achievement. The children in the latter sample were part of a longitudinal study in which virtually all children entering kindergarten in target schools were identified for testing. The ratio of boys to girls was about 4 to 1 in the school-identified sample, but it was about 1 to 1 in the epidemiological sample. Shaywitz et al. also found that, in contrast to the epidemiological sample, the school-identified group exhibited more behavior problems than a control group of nondisabled students. One possible criticism of this study is that the researchers relied solely on a discrepancy between ability and achievement to arrive at a diagnosis of "true" reading disability.

More research is needed about whether the greater number of males identified for learning disabilities is due to bias. The findings of Shaywitz et al. (1990) are provocative, especially the data showing that school-identified students with reading disabilities show a greater degree of behavioral problems that might prompt teachers to refer them for testing in order to get them out of their classrooms. Our best guess at this point is that some bias does exist, but that the biological vulnerability of males also plays a role. For example, the federal government's figures indicate that all disabilities are more prevalent in males, including conditions that are difficult to imagine as resulting from referral or assessment bias, such as hearing impairment (53% are males), orthopedic impairment (54% are males), and visual impairment (56% are males) (U.S. Department of Education, 1992).

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CEC Knowledge Check

Do you think educators and other school professionals should be held responsible for gender inequity within the learning disability label as part of the referral process? If so, how might this be accomplished? CC1K4, LD1K4

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CEC Knowledge Check

What etiological factors contribute to the increasing numbers of children labeled learning disabled? Could this be related to medical or neurobiological coexisting factors? If so, how? What might be the educational implications? LD2K1, LD2K2, LD3K1

Association with Other Disabilities

Once an individual is said to have a particular disability, the great temptation is to assume that the label we have chosen summarizes all of the difficulties or tells us what the problem really is. In fact, it is possible for people to have a combination of disabilities and special talents. Historically, every field of disability has sought

diagnostic purity—clear distinctions between a particular disability and all other categories. But that diagnostic purity has routinely proven elusive.

Research on disabilities of all kinds, including learning disabilities, has shown that they often come in multiples; that is, some involve more than one disability. Some authorities have estimated, for example, that about half of children who meet the criteria for one disability diagnosis also meet those for one or more other disorders (de Mesquita & Gilliam, 1994; Rosenberg, 1997). When one or more disabilities occur in the same person, they are referred to as **comorbid conditions.**

comorbid conditions two or more conditions (diseases, disabilities) occurring at the same time in a person

Comorbidity is often due to at least two factors. First, causal agents are frequently not particular about what part of the human organism they attack. For example, if a fetus does not have enough oxygen during birth (if the umbilical cord becomes wrapped around the neck and cuts off the oxygen supply), the result can be brain damage. It is virtually impossible to predict whether this damage will be localized or widespread. The more widespread, the more likely the child will have more than one disability. Second, the human organism is extremely complex and is made up of a seemingly infinite number of interrelated functions. When one function is affected, others are also likely to be altered. For example, when there is a hearing impairment, speech is likely to be affected. When there is attention deficit hyperactivity disorder, off-task behavior during instruction may result in a learning disability.

Learning disabilities can co-occur with virtually any other disability as well as with giftedness. Two of the most common conditions that occur concomitantly with learning disabilities are attention deficit hyperactivity disorder and serious emotional disturbance, or behavior disorders. In each case, it is often difficult to determine whether one condition is causing the other or whether each occurs independently. Researchers are just beginning to address the many issues of comorbidity and learning disabilities. (A special issue of *Journal of Learning Disabilities* was devoted to this topic. See Rosenberg, 1997.)

Who Works with People Who Have Learning Disabilities?

There are over 350,000 special education teachers in the United States, and a significant portion of them work with students who have learning disabilities (U.S. Department of Education, 2002b). Because most students with learning disabilities spend a significant portion of their school time in general education classrooms, they also are of concern to teachers in the elementary grades as well as secondary school teachers who specialize in specific subject areas.

Although it is easy to think of learning disabilities as the domain of educators, a diverse array of professionals is concerned with learning disabilities. For this reason, it is often the case that teachers and parents have contact with people from many disciplines outside of education.

In their day-to-day work, teachers are likely to see not just other teachers and administrators, but also speech-language pathologists and even occupational or physical therapists. From time to time, they may have contact with psychologists, attorneys, pediatricians, social workers, and many others.

Researchers concerned with learning disabilities also come from a similarly diverse group of professions. Studies and articles about learning disabilities appear in the journals of educators of many stripes (special, general, reading, physical, preschool, and postsecondary). In addition, physicians, speech pathologists, audiologists, psychologists, and others also conduct and report research about students with learning disabilities.

Because learning disabilities are primarily apparent in educational settings, we consider educators' roles to be the most important professional roles in the field. Nevertheless, it is important for educators, especially special educators, to know at least foundational concepts in other areas so that they can draw relevant concepts from those disciplines, help parents understand those concepts, and communicate clearly with representatives of those other disciplines. Our concern about understanding relevant concepts is manifested in our discussion in later chapters, such as those on the causes of learning disabilities, the problems of learning disabilities outside the K–12 grades, and so forth.

Can Learning Disabilities Be Overcome?

People naturally want to prevent disabilities, hope for a cure for any disability, or at least an intervention that will minimize it so they are not handicapped in ordinary life activities. These are core concepts in prevention (see the Current Trends and Issues box on page 38). If the disability involves academic learning and social behavior—things that seem to be under voluntary control and to the average person seem easily learned—then hope is redoubled that proper remedial training can make these difficulties disappear. Of all the various disabilities, therefore, learning disabilities are most vulnerable to the often-mistaken assumption that they can be cured, that they will not last a lifetime.

The early years of research and intervention in nearly every category of disability have been characterized by a search for and claims of a cure or something very near it. In fact, promoters of numerous interventions for almost every disability have claimed that their approach produces nearly miraculous effects, but these claims cannot be substantiated by careful scientific research. The strength of the appeal of these claims is in large measure a result of people's desire to avoid confronting a developmental disability that will persist over the individual's life span. The field of learning disabilities has had its share of excessive claims and quack treatments (Worrall, 1990). Students with disabilities should not be subjected to untested and potentially harmful practices.

A Critical Need for Effective Teaching

Although learning disabilities cannot be overcome in the sense of being cured, persons with learning disabilities can learn strategies that greatly diminish their disabilities' negative impact—perhaps as exemplified by the renowned individuals discussed earlier. And great strides have been made in developing instructional methods since, for example, the pioneering efforts of Cruickshank, Strauss, and

CURRENT TRENDS & ISSUES

Prevention

One of the first questions many people ask about learning disabilities, as with other conditions including medical and psychological disorders, is whether the problems students experience could have been prevented. Prevention is an attractive concept because it holds the promise of benefits, not just for the individuals who experience the disorders, but also for others close to the individual (e.g., family members) and society in general (e.g., a reduction of costs for later services). Thus, few people would oppose efforts to prevent learning disabilities. As attractive as it is, however, prevention is difficult to accomplish and uncommon in special education (Kauffman, 1997; Pianta, 1990).

Authorities in most areas discuss three different levels of prevention: primary, secondary, and tertiary.

Primary Prevention: Keep It from Happening.

Primary prevention efforts are usually aimed at promoting desirable future outcomes in virtually all of the population of individuals who may or may not develop the problem or disorder. For example, in hopes of preventing disease and early death, physicians encourage people to lead healthy lifestyles—to eat healthy foods, exercise, avoid risky behaviors such as smoking, wear seat belts, and so forth. Similarly, public health officials recommend that communities add fluoride to drinking water supplies in hopes of preventing or lessening tooth decay. By analogy, education should apply the most effective instructional practices available in hopes of preventing learning disabilities.

Such reasoning was part of the driving force behind the U.S. federal government's funding of the Reading First program (http://www.ed.gov/offices/OESE/readingfirst/). The Reading First program (and Early Reading First, too) aimed to provide support to state education agencies for making grants to local education agencies so that the LEAs could obtain instructional materials and supplies as well as inservice for teachers so that they could teach reading based on high-quality research about effective reading instruction.

Primary prevention does not always work, however. Sometimes the preventive measures are not applied faithfully or sufficiently. Or sometimes some people respond to the preventive measures but others are disposed to the condition and they will "get it" no matter what is done. This does not mean that we should not attempt primary prevention efforts, as they may still keep many from suffering the consequences of the condition. Later chapters in this book describe the most effective methods of teaching in general education that can help prevent many students' learning disabilities.

Secondary Prevention: Catch It Early and Stop It Right Away.

Secondary prevention efforts focus on early detection of problems and then on stopping or slowing the progress of the condition. In medicine, routine screenings for prostate or breast cancer are examples of early detection efforts. Physicians believe that if they catch the cancer early, they can treat it and prevent subsequent problems.

In education, schools often test students with simple screening measures to identify those learners who may have problems. For example, the state of Virginia has a Phonological Awareness and Literacy Screening program in which teachers assess nearly all children in the primary grades to identify those who are most at risk of failing in the early stages of reading; schools receive extra funds to provide supplemental instruction in hopes of preventing later reading problems (Invernizzi, Meier, Juel, & Swank, 1997). In this book we shall introduce you to powerful methods of screening and early intervention for learning disabilities.

Tertiary Prevention: Treat It Aggressively and Minimize the Consequences.

Tertiary prevention aims to reduce or stop an existing problem or condition from getting worse. When people have diabetes, for example, they must control their diet, exercise, and administer insulin (either as a pill or injection). If people with diabetes do not take such steps, they may have periods of shock or even have limbs amputated. Tertiary prevention is equivalent to treatment or intervention.

When students have learning disabilities, they already have clearly established problems. If they have been in schools providing primary or secondary prevention (or both), they probably have very serious problems. They must receive instruction that corrects for the imbalance in their skills and that uses the most effective intervention methods available. In this book, you will learn about those methods.

their colleagues (cf. Cruickshank, Bentsen, Ratzeburg, & Tannhauser, 1961; Werner & Strauss, 1941; see Weiss & Lloyd, 2001), whose interventions consisted largely of controlling extraneous stimuli and providing a reliable structure of routines.

Researchers have been devising and refining instructional procedures that are more effective than earlier strategies. Among the major approaches we discuss in subsequent chapters are *cognitive training* (which includes procedures such as self-monitoring or self-instruction), *mnemonics* (which includes the use of key words and other ways of assisting memory), *Direct Instruction* (which includes careful sequences of instruction, rapid and frequent responding, and immediate feedback and correction of errors), *metacomprehension training* (which provides students with strategies for thinking about remembering the major points in the material being read), and *scaffolded instruction* (which includes gradual reduction of assistance and reciprocal teaching). Although they vary in the specific skills taught and how they are related to the curriculum areas being taught, these approaches are all systematic procedures for teaching task-approach skills to students with learning disabilities so they can apply these skills in their actual academic situations.

Still, special education for students with learning disabilities will need to have certain features. As Zigmond described it,

> [It] is, first and foremost, instruction focused on individual need. It is carefully planned. It is intensive, urgent, relentless, and goal directed. It is empirically supported practice, drawn from research. To provide special education means to set priorities and select carefully what needs to be taught. It means teaching something special and teaching it in a special way. To provide special education means using the techniques and procedures described by Howell and Davidson [1997] for defining the special education curriculum appropriate for each student that will be designated on the annual IEP. To provide special education means monitoring each student's progress in the manner described by Deno [1997], and taking responsibility for changing instruction when the monitoring data indicate that sufficient progress is not being made. (1997, pp. 384–385)

We believe that special educators must provide instruction based on the very best research available. The instruction that special educators provide must be adapted to meet the individual needs of their students. In this book, we do not advocate a "learning disabilities program." We recommend an approach to serving individuals with learning disabilities that is based on making sure that students initially receive the most effective instruction available and that those who are not progressing according to reasonably accepted criteria under those conditions are then eligible for additional services—possibly prereferral services and, at least, special education services that are "intensive, urgent, relentless, and goal directed" (Zigmond, 1997, p. 384).

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CEC Knowledge Check

Of the three levels of prevention, which will teachers of students with learning disabilities most often use? Which do you think would be the most cost-effective? Which might provide the most optimal student outcomes?
CC1K1, CC1K4

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CEC Knowledge Check

What is the ultimate goal in teaching the five strategic learning methods to students with learning disabilities?
CC4S1

Learning Disabilities Are Life-Span Problems

There is increasing evidence that learning disabilities are truly developmental and not curable in the sense that a disease or unfortunate life circumstance might be.

There is diminishing support for the assumption that with proper intervention, learning disabilities can be reduced from a true developmental disability to a passing inconvenience. Nevertheless, the myth persists that most children with learning disabilities will outgrow these disabilities as adults. In fact, learning disabilities tend to endure into adulthood. Most successful adults who had learning disabilities as children continue to have specific difficulties, must learn strategies to cope with their problems, and must show extraordinary perseverance (Reiff et al., 1997).

This book is about how teachers and others concerned about students with learning disabilities can develop an understanding of learning disabilities as a field of study. Although they may not be readily recognized in the early years, learning disabilities extend across the life span. They are closely associated with bioneurological differences among people, and they may manifest themselves in one or more areas of human endeavor, including cognition, attention, social behavior and related social factors such as self-concept, language, and—especially—academic learning. As the field has matured, researchers have built a strong body of evidence showing that effective methods can address these problems. Teachers and others can help individuals with learning disabilities achieve at levels that allow them to live satisfying and fulfilling lives.

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CEC Content Standards

1. Foundations
2. Development and Characteristics of Learners
3. Individual Learning Differences
9. Professional and Ethical Practice

PORTFOLIO-BUILDING ACTIVITY

Demonstrating Mastery of the CEC Standards

Applying the information you have learned in Chapter 1, you can begin to develop your own personal perspective of the special education/learning disabilities field. This perspective will grow and develop as you engage in further study. Compose an initial draft of your Personal Philosophy of Special Education paper that addresses the following:

- What are the historical theories, who are the major contributors, and what are the relevant federal laws underlying the field of learning disabilities?
- How do these theories interact with the dynamic development of the learning disabilities definitions over time?
- What has been and will be the impact of these definitions on legal, ethical, and education policies and procedures?
- What are the issues of definition relative to personal society, family, culture, and label bias?
- Do you understand and how do you respect the heterogeneity of label characteristics in terms of development and lifelong effects?

SUMMARY

Why is it important to understand learning disabilities?

- Most teachers will have students with learning disabilities.
- Understanding learning disabilities helps understand normal learning.
- Many individuals with learning disabilities can contribute valuably to society.

Why are learning disabilities controversial?

- Defining learning disabilities has been and continues to be difficult.
- Discrepancy between ability and achievement, a difference often used to characterize learning disabilities, has been controversial.
- The criteria used to identify students as eligible for special education because of learning disabilities have varied greatly and may have been applied inconsistently.
- Learning disability is a construct rather than a clear entity.

How many people have learning disabilities?

- More than 5% of the U.S. school-age population are identified as having learning disabilities, and this represents about half of all students who are identified as needing special education.
- Although males are more likely to be identified as having learning disabilities than females, students with learning disabilities come from all ethnic backgrounds, ages, and social groups.
- Learning disabilities sometimes co-occur with other problems and disabilities.

Who works with people who have learning disabilities?

- School personnel other than special education teachers work with students with learning disabilities. These people include general education teachers, psychologists, and other specialists.
- Professionals from outside the schools (e.g., pediatricians) are also concerned with learning disabilities.

Can leaning disabilities be overcome?

- There are no simple remedies or easy cures for learning disabilities.
- Although their problems cannot be eliminated, given powerful instruction, students with learning disabilities can learn most skills and subjects.
- Learning disabilities are usually life-span problems. Most adults who had learning disabilities as children continue to experience some problems later in their lives.

REFLECTIONS ON THE CASES

1. Jamal's mother remarked that she would have to learn a lot about learning disabilities. How much do you think people in the general public know about learning disabilities? What misconceptions might people in the general public have about learning disabilities?
2. Shannon's mother said she gave "all the credit" to Shannon's first special education teacher. How accountable do you think general education teachers should be for the progress of their students? Should there be different levels of accountability when teachers teach students who have learning disabilities?
3. Do you think it was wise for Ms. Hamilton, Jamal's first-grade teacher, to advocate strongly for Jamal receiving special education services? Should she have done something else?
4. Shannon expressed concern about being able to use a calculator and to have extra time to complete tests on mathematics. Is it fair for some, but not all, students to have such accommodations?

What Causes Learning Disabilities?

- Historical Context
- Reluctance to Accept Neurological Causes
- Toward an Acceptance of Neurological Causes

How Does the Brain Function?

- Neurons Send and Receive Messages
- Different Parts of the Brain Have Different Functions
- Left and Right Hemispheres

How Can We Infer Neurological Dysfunction?

- Postmortem Studies
- Neuroimaging Studies
- Right-Hemisphere Brain Dysfunction

What Factors Contribute to Neurological Dysfunction?

- Hereditary Factors
- Teratogenic Factors
- Medical Factors
- Environmental Factors

What Should Educators Keep in Mind Regarding Causes?

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See Companion Website for detailed correlations between chapter content and Council for Exceptional Children Standards; **www.ablongman.com/hallahanLD3e**

CEC Knowledge and Skills Discussed in This Chapter

1. The physiological causes of learning disabilities.
2. The effects a learning disability can have on an individual's life.
3. Communication about the causes of learning disabilities with the families and individuals who have been labeled with learning disabilities.
4. How the foundational philosophies and learning disability theories inform identification, curriculum development, and educational practices.

Causes of Learning Disabilities

2

Jamal's dad, who died a few years ago, had lots of trouble in school. I remember him telling me how he could do pretty well in subjects as long they didn't require a lot of reading. The school people weren't really on the ball, so he didn't get much help. Finally, one of his teachers, I think it was in middle school, got him referred. Come to find out he had dyslexia. So when Jamal started having trouble in reading I wondered whether he'd gotten it from his father. I asked the special education teacher. Sure enough, she said reading problems can be inherited. But there's no real test to tell for sure. She also said that there's a pretty good chance that his problems are due to some kind of dysfunction in his brain.

Irene Smith, Jamal's mother

One of the most frustrating things plaguing the field of learning disabilities since its inception is the question of **etiology**—that is, what causes learning disabilities. The field was founded on the premise that there is a neurological basis to learning disabilities. But much of the early work was based on clinical guesswork because of the relatively unsophisticated techniques being used to measure neurological status back in the 1960s and 1970s. Much preliminary work in this area was speculative, so many professionals were skeptical about the validity of claims that learning disabilities were the result of neurological problems. By the early 1990s, the picture began to change as researchers developed more and more sophisticated computerized imaging techniques and other methods that could detect brain abnormalities with reasonable reliability. Today, most authorities subscribe to the view that learning disabilities emanate from some kind of differences in brain structure or functioning, and the most widely used definitions suggest that the causes are neurological rather than environmental.

etiology cause of a disability or abnormal condition

Current research also suggests that learning disabilities can be inherited. This does not mean that a parent with learning disabilities is guaranteed to have offspring with learning disabilities. But it does mean that a child of a parent with learning disabilities does run some risk of also having learning disabilities. Just how much risk there is scientists are not yet able to say. Neither, as Jamal's special education teacher said to Jamal's mother (see the opening quote), are they able to say for sure that the learning

disability is inherited. There are still many unanswered questions regarding causes of learning disabilities. But as you will soon see, researchers have made substantial progress in pinning down causal factors since the early days of the field.

What Causes Learning Disabilities?

Historical Context

neurological dysfunction a condition wherein a person's behavior (e.g., learning, attention, and so forth) is affected by abnormal functioning of the brain; the exact abnormal functioning is as yet poorly understood

aphasia a condition that results in problems in speech production and/or comprehension due to an injury to the brain

dyslexia severe impairment in the ability to read that is generally thought to be due to neurological factors

word blindness a term used at the beginning of the 20th century (but no longer in use) to describe persons with severe reading impairment

One reason for a presumption of **neurological dysfunction** in learning disabilities is that there is often no other plausible explanation for the child's failure to learn. Another reason is that the field emerged gradually from the work of physicians who identified symptoms of known brain injury that were in many respects similar to the behavior of people who had learning disabilities but who did not have confirmed damage to their brains.

When neurology and ophthalmology were developing as medical specialties in the 19th and early 20th centuries, physicians began describing problems in understanding and using spoken and written language that were associated with damage to specific areas of the brain. Pierre Paul Broca and Carl Wernicke were 19th-century European physicians who identified particular areas of the brain that control speaking and understanding spoken language. Their work laid the foundation for understanding the speech and language problems termed **aphasia.** Other late 19th- and early 20th-century physicians researched reading disabilities that they called **dyslexia,** a term introduced by German ophthalmologist R. Berlin, or **word blindness,** a phrase invented by Scottish ophthalmologist James Hinshelwood at the beginning of the 20th century.

Another neurologist who had an important influence on the development of learning disabilities and the presumption of neurological dysfunction was Samuel Orton. He believed that reading disability was a result of mixed dominance of the cerebral hemispheres—meaning that neither side of the brain was clearly in control—which led to a breakdown in perceptual-motor abilities (Orton, 1937). He theorized that mixed dominance was inherited and led to perceptual reversals (e.g., reading "was" for "saw").

Although Orton's theory of mixed dominance has since been disproved, his educational theories have led to the development of systematic instructional procedures in reading, spelling, and handwriting (Gillingham & Stillman, 1965), and his work lives on in the International Dyslexia Association. His theories also influenced speech-language and hearing specialists such as Katrina de Hirsch and Helmer Myklebust, whose methods were prominent in the 1960s and 1970s (de Hirsch, Jansky, & Langford, 1966; Johnson & Myklebust, 1967; Myklebust, 1973).

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CEC Knowledge Check

The historical foundations of the field of learning disabilities fall into three basic philosophical camps: disorders of spoken and written language, disorders of perceptual-motor process, and disorders of speech-language and hearing. Who are additional major contributors in each of these perspectives? LD1K1, LD1K2

Reluctance to Accept Neurological Causes

Even though many of today's professionals believe that learning disabilities are neurologically based and even though the most popular definitions of learning disabilities reflect a neurological basis for learning disabilities, the field was originally slow to embrace neurological dysfunction as a viable causal factor. There were at least two reasons why researchers and practitioners may have been skeptical about

a neurological basis for learning disabilities: (1) the questionable accuracy of early neurological measures and (2) the emphasis on behaviorism and environmentalism.

Problems of Inaccurate Measurement of Neurological Dysfunction

Many authorities rightfully questioned the reliability and validity of the standard tests neurologists used to diagnose neurological dysfunction in children with learning disabilities because in the 1960s and 1970s these tools were relatively crude. For example, in both research and clinical practice, neurologists still relied heavily upon the measurement of **soft neurological signs,** largely behavioral indices such as poor balance, poor visual-perceptual skills, poor fine motor coordination, distractibility, and clumsiness. Although these signs are prevalent in people with obvious cases of brain injury, they are not always accurate indicators of more subtle cases of brain dysfunction—the kind of cases that are likely to be learning disabled.

soft neurological signs behavioral indicators of neurological dysfunction, such as poor balance, poor visual-perceptual skills, and distractibility; although often present in persons with documented brain injury, these signs do not always mean a person has brain injury or brain dysfunction

Emphasis on Behaviorism and Environmentalism

A second reason professionals were hesitant to look to neurology for answers to causal questions was the popularity of behaviorism and environmentalism in the social sciences in the 1960s and 1970s (Pinker, 2002). **Behaviorism** is a philosophical orientation to psychology that stresses the study of observable behaviors instead of nonobservable mental events. It is closely linked to learning theory, which postulates that all behavior is learned and is shaped by rewards and punishments.

Intimately tied to behaviorism and learning theory, **environmentalism** holds that one's learning environment is crucial to psychological development. The 1960s was the heyday of the environmentalist position in child psychology relative to causes of learning and personality development. Several researchers contributed to the dominance of the environmentalist position. In 1961, J. McVicker Hunt published *Intelligence and Experience,* in which he reviewed several studies, many on lower animals, which demonstrated the devastating impact that lack of experiences could have on development. In this same vein, Rosenzweig (1966) published an influential study comparing rats placed in stimulus-"enriched" cages (e.g., numerous paraphernalia for exploratory activity) with those placed in cages devoid of stimuli. He found differential effects on brain structure and chemistry in that the former had thicker cortexes and more acetylcholine, a chemical important for learning.

behaviorism a theoretical approach that stresses the importance of observing and measuring observable behaviors rather than nonobservable mental events; closely linked to learning theory and environmentalism

environmentalism a theoretical approach that posits that what individuals encounter in their environment determines what they learn and how they behave

With the optimism created by environmentalists, social scientists pushed for early intervention programs designed to reverse the negative effects of poverty on the intellectual development of young children. For example, Head Start, aimed at providing health and educational services for preschoolers from impoverished backgrounds, was instituted as part of President Lyndon Johnson's War on Poverty.

Some professionals used the behaviorists' and environmentalists' positions to point to another possible cause of learning disabilities in children—poor teaching, sometimes referred to as "dyspedagogia" (*dys* = poor, *pedagogia* = teaching) (Cohen, 1971). Researchers pointed out that teachers often spend an appallingly low percentage of their time actually engaged in reading instruction and that this and other poor instructional practices over a period of years can result in students developing learning disabilities.

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CEC Knowledge Check

In your words, define the "nature etiology" and "nurture etiology" of learning disabilities. CC1K1, LD1K1, LD2K1

Toward an Acceptance of Neurological Causes

Several factors have helped make professionals generally more favorably inclined toward neurological explanations of learning disabilities, chiefly the decrease in the popularity of behaviorism and environmentalism and the increase in the utility of neurological measures.

Decrease in Popularity of Behaviorism and Environmentalism

Although many authorities still think that behaviorism is an important theoretical position, several have swung to a more cognitive perspective (see Schulz, 1994). Cognitive psychologists recognize nonobservable thought processes as legitimate for scientific inquiry. And more and more cognitive psychologists are blending their work with that of neurologists, making connections between thought processes in the brain and their neurological underpinnings (Pinker, 2002). Similarly, although environmentalism is still seen as a viable position by most working in the fields of education and psychology, some of the unbridled optimism of its early proponents has been tempered by the less than overwhelmingly positive results of early intervention programs. Intervening to remedy the devastating effects of poverty on child development has proved more difficult than was at first assumed. The disillusionment with behaviorism and environmentalism as causal explanations of learning problems has thus left a void that work in the neurological arena has started to fill.

Technological Advances in Neurological Research

Probably the major reason professionals are now more persuaded that neurological dysfunction is a viable causal factor in many cases of learning disabilities is the advances in neurological research. Starting in the late 1980s, neurological researchers began to make substantial progress in identifying neurological factors as underlying learning disabilities. Much of this progress has been due to advances in computerized neurological measures. Such techniques as **magnetic resonance imaging (MRI), positron emission tomography (PET-scan),** and **functional magnetic resonance imaging (fMRI)** have expanded the area of brain research. (See the Today's Technology box on page 47.) Although expense has thus far kept these techniques from being widely used to diagnose individual cases of learning disabilities in clinical practice, they have allowed researchers to begin to build a case for the importance of neurological dysfunction in many cases of learning disabilities. Before discussing the use of these procedures to determine neurological causes of learning disabilities, we present the basic anatomy of the brain and some of the functions performed by its major parts.

magnetic resonance imaging (MRI) a neuroimaging technique that uses radio waves to produce cross-sectional images of the brain

positron emission tomography (PET-scan) a computerized method for measuring blood flow in the brain; during a cognitive task, a low amount of radioactive dye is injected in the brain; the dye collects into active neurons, indicating which areas of the brain are active

functional magnetic resonance imaging (fMRI) an adaptation of the MRI (magnetic resonance imaging) used to detect changes in the brain while it is in an active state that, unlike the PET-scan, does not involve the use of radioactive materials

neurons brain cells responsible for sending and receiving information

soma the cell body, composed of the nucleus and material that supports the functioning of the neuron

dendrites treelike projections of the neuron that receive messages from the environment and other neurons

How Does the Brain Function?

Neurons Send and Receive Messages

Neurons are the most important cells in the human nervous system, being responsible for sending and receiving information in the brain. Most **neurons** consist of

TODAY'S TECHNOLOGY FOR LEARNING DISABILITIES

Computerized Imaging and the Brain

A number of recent technological advances in X-ray techniques and computers allow researchers and clinicians to obtain better images of the living brain. Three such techniques are magnetic resonance imaging, positron emission tomography, and functional magnetic resonance imaging.

Magnetic Resonance Imaging

In magnetic resonance imaging (MRI), a scanner sends a strong magnetic field through the head. The magnetic field causes changes in the orientation of hydrogen atoms, which are detected by the scanner. Because various neural structures contain different amounts of hydrogen, the scanner detects these differences and uses these data to formulate photographs of slices of the brain.

Positron Emission Tomography

Whereas an MRI is usually used with people when they are at rest, positron emission tomography (PET-scan) can be used to take pictures of the brain while a person is engaged in various activities. It is thus a way of viewing the brain in an active state. PET-scans detect changes in metabolic activity in various parts of the brain. The person is usually injected with a substance of low radioactivity that is similar to glucose. Along with blood, the substance collects in active brain neurons and can be detected by a scanner. While the person performs a task, such as reading or memorizing, the PET-scan can detect which areas of the brain are activated because the radioactive substance is transported to them.

Functional Magnetic Resonance Imaging

Like the PET-scan, functional magnetic resonance imaging (fMRI) can be used to detect changes in the brain while it is in an active state. With the fMRI, one can record the metabolism of the brain as a person engages in a cognitive task. Unlike the PET-scan, the fMRI has the advantage of not involving the use of radioactive materials.

four structures: (1) the cell body, or soma, (2) dendrites, (3) the axon, and (4) terminal buttons. These structures allow neurons to communicate with one another (Pinel, 2000).

The **soma** contains the nucleus and material that supports the functioning of the neuron. **Dendrites** are treelike projections that receive messages from the environment (e.g., sights, sounds, smells) or from other neurons. They receive messages from other neurons through the other neurons' axon and terminal buttons. The **axon** is a long, tubelike extension of the neuron that carries messages to the dendrites of other neurons. These electrical-chemical messages are transported from the axon to the dendrites via **terminal buttons**—buttonlike structures that secrete chemicals (**neurotransmitters**) into the **synapse,** a small gap between the axon and the dendrite. The axon is covered and insulated by a **myelin sheath,** a fatty tissue. The particular neurotransmitter secreted helps determine whether a neuron will receive the message from another neuron and then send it to other neurons. Figure 2.1 (page 48) presents an overview of how electrical-chemical messages are carried from one neuron to another over the synapse.

Our explanation of neuronal communication is brief and necessarily simplified. The fact that scientists have estimated that there are over 60 trillion synapses in the human brain makes the study of the structure and function of neurons extremely complicated (Shepard & Koch, 1990).

axon a long, tubelike extension of the neuron that carries messages to the dendrites of other neurons

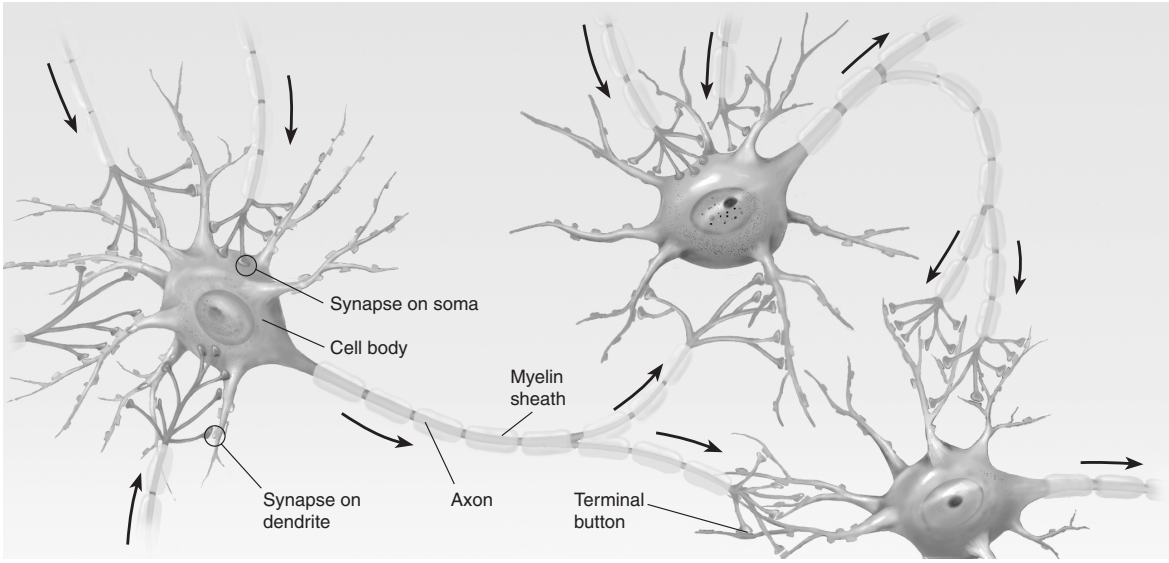
terminal buttons buttonlike structures at the end of the axon that secrete a neurotransmitter into the synapse

neurotransmitters chemicals secreted by the terminal buttons that transport electrical-chemical messages from the axon to the dendrites of neurons; the particular neurotransmitter secreted helps determine how neurons send and receive messages

synapse a small gap between the axon and the dendrite

myelin sheath a fatty tissue that covers and insulates axons

FIGURE 2.1 **An Overview of the Synaptic Connections between Neurons.** The arrows represent the directions of the flow of information.



Source: From *Physiology of Behavior,* 7th ed. (p. 30, Fig. 2.4) by N. R. Carlson, 2001, Boston: Allyn and Bacon. Copyright © 2001 by Pearson Education. Reprinted by permission of the publisher.

Different Parts of the Brain Have Different Functions

Neurologists have identified several areas of the brain they think are responsible for different functions (e.g., sensory, motor, language, cognition, and emotion). But because of the brain's complexity, neuroscientists do not always agree on the specificity of some of these brain-behavior connections. Not only is there sometimes disagreement about whether a certain behavior is controlled by one or another part of the brain, but there can also be dispute about whether one or several parts of the brain are implicated. Furthermore, one part of the brain can take over certain functions for a damaged portion of the brain. Because of these disagreements, we present only those basic brain-function relationships most neurologists agree upon.

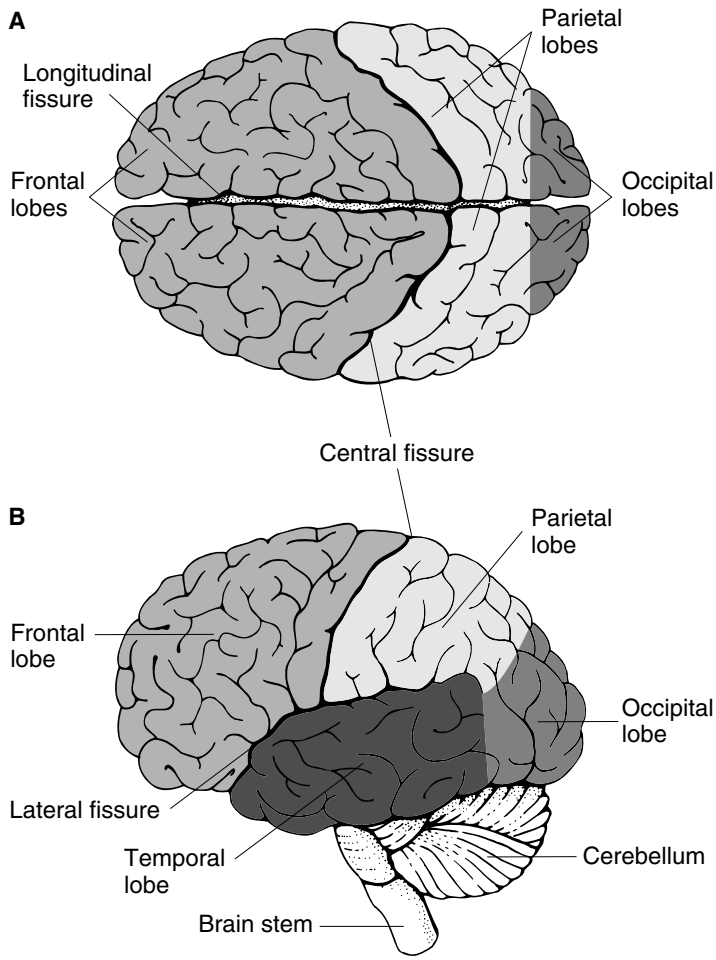
Neurologists commonly refer to the brain as being divided into the brain stem, cerebellum, and cerebral cortex, with the last consisting of four types of lobes: frontal, parietal, occipital, and temporal. The cerebral cortex has a left and a right hemisphere, both of which contain all four kinds of lobes. In other words, there are a left and right frontal lobe, a left and right parietal lobe, and so forth. Figure 2.2A depicts a top view of the brain, showing both hemispheres; Figure 2.2B shows a side view of the left hemisphere, the cerebellum, and the brain stem.

brain stem the part of the brain supporting the cerebral cortex and connecting it to the spinal cord; regulates survival reflexes such as respiration and heart rate

Brain Stem

The two hemispheres of the cerebral cortex rest on the **brain stem,** which serves as a connection to the spinal cord. The brain stem regulates important survival reflexes such as respiration and heart rate.

FIGURE 2.2 (A) A top view of the two cerebral hemispheres; (B) A side view of the left cerebral hemisphere, the brain stem, and the cerebellum.



Source: Adapted from *Biopsychology,* 4th ed. (p. 72, Fig. 3.2) by J. P. J. Pinel, 2000, Boston: Allyn and Bacon. Copyright © 2000 by Pearson Education. Reprinted by permission of the publisher.

Cerebellum

The **cerebellum,** located beneath the cerebral cortex and adjoining the brain stem, is more complex than its size suggests. Though comprising only about 10% of the brain's mass, it contains more than half its neurons (Pinel, 2000). The cerebellum regulates several behaviors having to do with movement (e.g., balance, gait, speech, eye movements). Damage to this area of the brain can result in profound difficulties in controlling a variety of movements. Following is an example of a common test neurologists use to assess functioning of the cerebellum, which you can try:

cerebellum the part of the brain below the cerebral cortex next to the brain; regulates several behaviors having to do with movement

Have a friend place his or her finger in front of your face, about three-quarters of an arm's length away. While your friend slowly moves his or her finger around to serve as a moving target, alternately touch your nose and your friend's finger as rapidly as you can. If your cerebellum is normal, you can successfully hit your nose and your friend's finger without too much trouble. People with lateral cerebellar damage have great difficulty; they tend to miss the examiner's hand and poke themselves in the eye. (Carlson, 2001, pp. 266–267)

Cerebral Cortex

cerebral cortex the layer of tissue covering the cerebral hemispheres of the brain; divided into four types of lobes for each hemisphere (frontal, parietal, occipital, and temporal) that regulate motor movements, executive functions, and emotions; bodily sensations and visual perception; visual functions; and attention, memory, and language, respectively

A layer of tissue covering the cerebral hemispheres, the **cerebral cortex** is divided into four types of lobes: frontal, parietal, occipital, and temporal. The cerebral cortex is deeply furrowed (cortex means "bark"), which greatly increases the surface area of the brain. In fact, about two-thirds of the cortex's surface is contained in the creases (Carlson, 2001). The largest grooves are called "fissures." The central fissure divides the frontal lobe from the parietal lobe, and the lateral fissure separates the temporal lobe from the frontal and parietal lobes. (See Figure 2.2A and B.)

Frontal Lobes of the Cerebral Cortex

frontal lobes two lobes located in the front of the brain; responsible for executive functions

executive functions the ability to regulate one's behavior through working memory, inner speech, control of emotions and arousal levels, and analysis of problems and communication of problem solutions to others

prefrontal lobes the forward part of the frontal lobes that may be implicated in the control of emotions

Although the **frontal lobes** are responsible for some motor movements, they are perhaps best known for being instrumental in the regulation of one's behavior. Psychologists refer to self-regulation, or the ability to control one's emotions and to problem solve, as being a part of a person's **executive functions.**

The first inkling that the frontal lobes play a crucial role in executive functions came from the celebrated case of Phineas Gage, a dynamite worker in the mid 1800s who had a steel rod accidentally propelled through his cheek and out the top of his head, passing through the front part of the frontal lobes (Figure 2.3). Miraculously, Gage survived; however, he suffered serious alterations in personality. He was no longer the industrious, energetic worker he had been before the accident. He was now "childish, irresponsible, and thoughtless of others. He was unable to make or carry out plans, and his actions appeared to be capricious and whimsical" (Carlson, 2001, p. 347).

The front part of the frontal lobes, the **prefrontal lobes,** have also been implicated in the control of emotions. The outmoded prefrontal lobotomy—which severed the connections between the prefrontal lobes and the rest of the brain—was intended as a cure for psychiatric patients who were under severe emotional distress and anguish. Over 40,000 prefrontal lobotomies were performed in the middle part of the 20th century, and its developer was awarded the Nobel Prize in physiology (Pinel, 2000). After several years of careful study, however, researchers concluded that the side effects of prefrontal lobotomies were too devastating, and the surgery was discontinued. They left people childish and irresponsible, almost totally indifferent to the consequences of their actions. Their pathological emotions were gone, but so were their normal ones (Carlson, 2001).

Parietal Lobes of the Cerebral Cortex

parietal lobes the lobes of the cerebral cortex involved in the integration of bodily sensations and visual perceptions

The **parietal lobes** are involved in the integration of bodily sensations and visual perception. Neurologists think that the parietal lobes are crucial to the ability to perceive objects as integrated entities:

FIGURE 2.3 **A Bust and Skull of Phineas Gage.** The steel rod entered his left cheek and exited through his frontal lobes.

Source: From the Warren Anatomical Museum, Harvard Medical School. Reprinted by permission.

> An object affects different senses, yet we perceive the object as one whole. A cat is furry, purrs, and projects a visual image. Although these sensations travel along different pathways, we perceive only one cat. If there are defects in visuo-spatial centers [of the parietal lobes], the person has difficulty mapping different sensations involved in the same object. She will perceive the cat visually and hear purring but cannot coordinate these two perceptions. (Haberlandt, 1996, p. 51)

Occipital Lobes of the Cerebral Cortex

Although other parts of the brain are also involved, the **occipital lobes** are primarily dedicated to various aspects of visual perception. Damage to the occipital lobes, for example, can result in a condition known as *visual agnosia,* which is the inability to recognize common objects even though one may have normal visual acuity.

occipital lobes the lobes of the cerebral cortex dedicated to various aspects of visual perception

Temporal Lobes of the Cerebral Cortex

The **temporal lobes** serve a variety of important functions related to learning, being involved in attention, memory, and language production and expression. Because of their significance for learning, there has been much speculation about their role in learning disabilities, as discussed in more detail in the next section.

temporal lobes the lobes of the cerebral cortex involved in attention, memory, and language production and reception

Left and Right Hemispheres

left and right hemispheres the two cerebral hemispheres of the brain, each of which receives sensory information from and controls movement of the opposite side of the body; in most people, especially right-handers, the left hemisphere is more important for language production and comprehension than the right hemisphere

The **left and right hemispheres** of the brain are relatively distinct with regard to their functions. For the most part, each receives sensory information from and controls movement of the opposite side of the body. For example, objects presented in the left visual field are perceived in the right hemisphere, sounds heard by the right ear are perceived in the left hemisphere, and movement of the left hand is controlled by the right hemisphere.

Another important way in which the two hemispheres differ is with respect to language. In most people, the left hemisphere is more important for language production and comprehension than the right hemisphere. In over 90% of right-handed individuals, the left hemisphere is specialized for language; in about 70% of left-handed individuals, the left hemisphere is specialized for language (Milner, 1974, cited in Pinel, 2000).

Broca's and Wernicke's Areas

aphasia a condition that results in problems in speech production and/or comprehension due to an injury to the brain

Broca's area part of the brain's left frontal lobe associated with the ability to speak

Wernicke's area part of the left temporal lobe associated with the ability to comprehend language

Two researchers working in the 19th century were instrumental in drawing attention to the left hemisphere's role in language. Paul Broca performed postmortem examinations of the brains of several persons who had exhibited **aphasia**—severe problems in speaking—and found they all had damage to an area in the left frontal lobe. Several years later, Carl Wernicke identified an area in the left temporal lobe that he hypothesized was largely responsible for speech comprehension. These areas have come to be known, respectively, as **Broca's area** and **Wernicke's area** (Figure 2.4).

Subsequent research has shown that it is not always possible to predict precisely the type of language problem a person will have based on Broca's or Wernicke's area (Pinel, 2000). Documented damage to these areas does not always result in the same kinds of speech problems, and there have been cases of surgical removal of these areas with little disruption of speech production or comprehension. Furthermore, there is evidence that the right hemisphere is also responsible for certain aspects of language and communication. For example, the ability to convey and recognize emotion in one's tone of voice is largely a right-hemisphere activity (Carlson, 2001; Pinel, 2000).

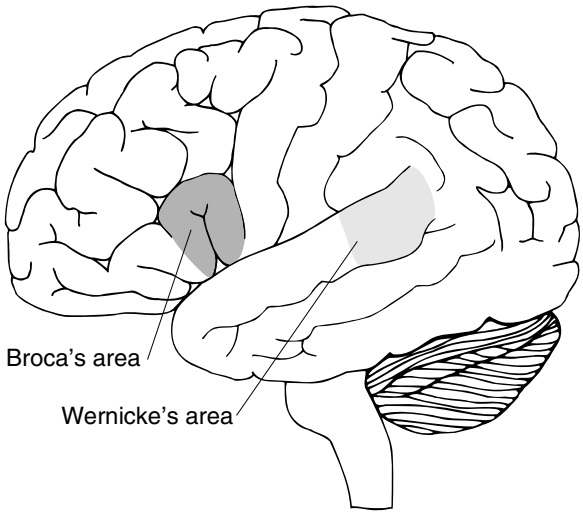
Even though it is dangerous to predict in individual cases the connections between specific brain areas and specific behaviors, the weight of the evidence since the time of Broca and Wernicke indicates that, for most people, the left hemisphere is primarily responsible for many important aspects of language, especially for those who are right-handed. Several methods have been used in pointing to the dominance of the left hemisphere for language. For example, patients who are about to undergo surgery that might affect speech are often given an anesthetic first in the artery leading to the one hemisphere and then, after the anesthetic has worn off, in the artery leading to the other hemisphere. Researchers have noted that, for the overwhelming majority of right-handed people and for the majority of left-handed people, the anesthetization of the left hemisphere results in an inability to speak.

split-brain studies studies of the effects on patients of a surgical procedure that severs the area between the two hemispheres of the brain

Split-Brain Studies

Perhaps the most dramatic demonstrations of the differential abilities of the left and right hemispheres have been the much celebrated **split-brain studies** (Gazzaniga &

FIGURE 2.4 The Location of Broca's Area and Wernicke's Area



Source: From *Biopsychology,* 2nd ed. (p. 514, Fig. 16.2) by J. P. J. Pinel, 2000, Boston: Allyn and Bacon. Copyright © 2000 by Pearson Education. Reprinted by permission of the publisher.

LeDoux, 1978; Sperry, 1964). Split-brain studies came about as the result of a surgical procedure performed on patients with severe cases of epilepsy. In these patients, neurons in one hemisphere stimulate neurons in the other hemisphere, creating seizures so intense that they are not controllable by drugs. Severing the area between the two hemispheres reduces the number of seizures by prohibiting the neurons in one hemisphere from setting off those in the other hemisphere.

Split-brain patients provide testimony to the fact that the two brain hemispheres are primarily responsible for different functions. For example, one of the first things these patients say is that their left hand seems to have "a mind of its own" (Carlson, 2001, p. 5). They may be intently reading a book (a left-hemisphere activity) they are holding in their left hand when suddenly the left hand puts the book down. This occurs because their left hand is controlled by their right hemisphere, and the right hemisphere, not being able to read, gets bored.

Researchers have tested split-brain patients using a variety of laboratory tasks. In one typical procedure, the picture of a common object, such as a ball, is flashed to the right or left visual field of these individuals, and their responses are compared. When it is shown to the right visual field, these patients say they see a ball because it is seen by the left hemisphere, the hemisphere in control of speech. With eyes closed, they can also pick out the ball from among several objects using the right hand. They pick out the ball at a chance level of performance, however, when using the left hand. When objects are shown to the left visual field, the results are the opposite. When the ball is shown to the left visual field and hence the right hemisphere, these patients usually say they do not see anything. With eyes closed, however, the left hand, which is controlled by the right hemisphere, is able to pick

out the ball from among several objects; but the right hand, which is controlled by the left hemisphere, does no better than chance.

How Can We Infer Neurological Dysfunction?

Historically, much of the rationale for implicating neurological dysfunction as a cause of learning disabilities has been inferential. Neurologists and other professionals have noted that many of the behaviors and learning problems of people with obvious and well-documented brain injury are also present, although sometimes to a less pervasive degree, in children with learning disabilities. In other words, the types of learning problems and behavioral deviations that occur in those who have brain tumors or who have had strokes or head wounds are also present in some children with learning disabilities. For example, virtually all the behaviors noted previously as associated with damage to the cerebellum and the cerebral cortex are also evident in some children with learning disabilities. These range from problems of movement associated with damage to the cerebellum to attention, language, and memory difficulties associated with damage to the temporal lobes.

Inferring neurological dysfunction in children with learning disabilities from what we know about the behavior of documented cases of brain injury, however, has its limitations. Without some more direct measure of brain structure or functioning, we cannot be sure whether the behavioral or learning problems of the child with learning disabilities are due to the same causes as those of individuals with documented brain injury.

More direct methods of determining whether learning disabilities are the result of neurological dysfunction include postmortem studies and, more recently, neuroimaging studies. Although such studies have not been definitive, they strongly indicate that learning disabilities, especially reading disabilities, are neurologically based.

Postmortem Studies

The first evidence suggesting that neurological abnormalities are present in people with dyslexia came from autopsies. Galaburda and Geschwind and their colleagues conducted more than a dozen autopsies on the brains of individuals who had dyslexia and compared them with results of over a hundred autopsies performed on brains of persons (infancy through adulthood) who were not dyslexic (Galaburda & Kemper, 1979; Galaburda, Menard, & Rosen, 1994; Galaburda, Sherman, Rosen, Aboitiz, & Geschwind, 1985; Geschwind & Levitsky, 1968; Humphreys, Kaufmann, & Galaburda, 1990).

Although the number of cases of persons with dyslexia studied by Galaburda and Geschwind was relatively small, their findings were consistent. They found that in the majority of nondyslexic brains, a section of the left temporal lobe was larger than the same area in the right hemisphere. This area, which includes a large portion of Wernicke's area (see Figure 2.4), is referred to as the **planum temporale.** The results for those who were dyslexic were different; in the majority of cases, the planum temporales in the left and right hemispheres were the same size or the planum temporale in the right hemisphere was bigger than that in the left hemisphere.

planum temporale a portion of the brain in Wernicke's area in the left temporal lobe that research suggests is affected in persons with dyslexia

Neuroimaging Studies

As we noted earlier (see the Today's Technology box on page 47), neuroimaging methods are now being used by researchers to provide information on brain structure and function, with MRIs being used for the former and PET-scans and fMRIs being used for the latter. Although still too experimental to be used clinically to diagnose learning disabilities, researchers have found significant differences in both structure and function between the brains of those with and without dyslexia. Although a few studies have found the same asymmetrical differences between the left and right hemispheres that Galaburda and Geschwind found, several have not. At this point, most authorities have concluded that neuroimaging studies have failed to lend substantial support to Galaburda and Geschwind's conclusions (Habib, 2000).

Even though Galaburda and Geschwind's findings of differences in left-right hemisphere symmetry may be questionable, what is without question is that several independent research teams have found structural and functional differences between persons with and without dyslexia (Grigorenko, 2001; Habib, 2000). Although these researchers have not always found the exact same areas of the brain to be implicated, there has been enough consistency to draw the following conclusions:

1. The left hemisphere of the brain is more often the site of the dysfunction. However, some researchers have also found differences in the right hemisphere between persons with and without dyslexia.
2. Research has been fairly, but by no means totally, consistent in pointing to the following locations as dysfunctional: Broca's area, planum temporale, Wernicke's area, angular gyrus (an area immediately behind Wernicke's area). (See Figure 2.4.)
3. Research has been less consistent in pointing to the following locations as dysfunctional: occipital lobes, parietal lobes (see Figure 2.2), **corpus callosum** (a band of nerve fibers that connects the two hemispheres of the brain).

corpus callosum a band of nerve fibers that connects the two hemispheres of the brain

The evidence gathered thus far indicates that it is unlikely that dysfunction of only one specific area of the brain is responsible for reading disabilities. It is much more likely that more than one area of the brain is involved and that specific sites of dysfunction vary from one person to the next. Furthermore, it is likely that the specific types of reading problems are linked generally to different areas of the brain. For example, there is fairly strong evidence linking the ability to blend and break apart sounds, or phonemes, in words to activity in the left temporal lobe. Referred to as **phonological awareness,** these abilities are considered the building blocks of learning to read. (We discuss phonological awareness more fully in Chapter 12 on reading.)

phonological awareness the ability to blend sounds, segment the sounds of words, rhyme, and in other ways manipulate the sounds of spoken words

Right-Hemisphere Brain Dysfunction

Most neurological research in learning disabilities has focused on dyslexia, or severe reading disabilities. And for this reason most of the research has focused on the impact of the left hemisphere on brain dysfunction. This is not surprising, given the

nonverbal learning disabilities disabilities that manifest in problems in math, self-regulation, and particularly social functioning

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CEC Knowledge Check

If left-brain dysfunction impacts a child's life differently than right-brain dysfunction, how, in your opinion, would this theory and research information impact curriculum and instruction for such children? CC7K1

Shannon

importance of the left hemisphere for language and the fact that many persons with learning disabilities have language and reading problems. Some researchers, however, have posited that persons who have a dysfunctional right hemisphere exhibit what is referred to as **nonverbal learning disabilities** (Myklebust, 1975; Rourke, 1989, 1995; Semrud-Clikeman & Hynd, 1990). This term is somewhat of a misnomer, because persons with nonverbal learning disabilities often display subtle problems with using language, especially in social situations (Rourke & Tsatsanis, 1996).

In the perceptual realm, individuals with nonverbal learning disabilities have difficulties with visual-spatial and tactual tasks. In the cognitive arena, they often have difficulty in math and in self-regulation and organization. Terms such as *spacy* and *in a fog* are often used to characterize these children (Denckla, 1993).

But the social area is where persons with nonverbal learning disabilities encounter their most significant problems. They are often socially inept, showing deficits in their ability to interpret the social behavior of others and to understand the impact of their own immature behavior on them. These deficits are especially pronounced in novel situations. Even though some may be academically competent, adults with nonverbal learning disabilities often have trouble holding a job because of their problems in social interaction. Some authorities see these persons as being at risk for depression and suicide (Bender, Rosenkrans, & Crane, 1999).

As we note in Chapter 7 (Social, Emotional, and Behavioral Problems), Shannon has a tendency toward depression and has had difficulties in making and keeping friends. These observations, coupled with the fact that her major academic problems lie in math (see Chapter 14 on math disabilities), make her a prime candidate for being considered as having nonverbal learning disabilities. The excerpt from Shannon's special education teacher's report (see the Case Connections box on page 57) also suggests that she has nonverbal learning disabilities.

What Factors Contribute to Neurological Dysfunction?

There are a variety of reasons why an individual might have neurological dysfunction. These fall under the headings of (1) hereditary, (2) teratogenic, (3) medical, and (4) environmental factors.

Hereditary Factors

Professionals have long surmised that heredity plays a significant role in many cases of learning disabilities. The authors of some of the first reported cases of reading disability, for example, noted that children with reading disabilities often had relatives who were reading disabled (Hinshelwood, 1907; Stephenson, 1907; Thomas, 1905). Genetics researchers have used two types of studies to look at the issue of whether the condition of learning disabilities is inherited: familiality and heritability.

CASE CONNECTIONS

Shannon

Excerpt From Shannon's Educational Evaluation

The following is an excerpt from the educational evaluation conducted by Martin Schein, Shannon's eighth-grade special education teacher. This report was part of Shannon's reevaluation to determine her eligibility for special education services. This particular excerpt was the introduction to a more extensive report that detailed scores on a variety of educational tests.

> Shannon is currently an eighth-grader at Martin Luther King, Jr., Middle School. She receives one period of resource assistance daily and one period of collaborative math daily. Her academic grades are: English language arts A–, social studies A, earth science D, and math D. Her science grade was low because Shannon did not do well on tests. Her teacher reports that she has problems grasping new concepts and applying learned facts to new situations. Although she pays attention in class during direct instruction, she is very unengaged when involved in cooperative learning activities. Her math teacher reports that basic math facts and sequential operations are especially weak. She is attentive some of the time, somewhat disorganized, but turns assignments in on time in math. Shannon's social studies teacher reports that she actively participates in class discussions and seems eager to learn more about the subject matter. Her English teacher reports that she likes creative writing and expressing her opinions about what she has read but still has problems with some mechanics in writing.
>
> I reinforce whatever skills the language arts teacher is trying to teach. In resource, Shannon uses her time wisely; however, sometimes she complains because she wants to use the class as a study hall instead of a time to get extra drill and practice in her weak areas. Left on her own, though, she seems to forget what she is doing and dawdles and daydreams.
>
> Classroom observations reveal that Shannon sometimes experiences anxiety when taking a test. For example, when given a science test, she missed several questions on the first try. After experiencing some success, she was able to go back and correct some of her mistakes.

Familiality

Familiality is said to be operating when a particular condition, such as a reading disability, occurs at a greater than chance rate in a family. In other words, **familiality** is the tendency for something to "run in a family."

familiality when a condition, such as reading disability, occurs at a greater-than-chance rate in family relatives

The turn-of-the-century researchers, noted previously, who found evidence of familiality were working with small numbers of cases. In more current studies, researchers have used larger samples to document that reading disability is, indeed, a familial condition (Grigorenko, 2001; Hallgren, 1950; Pennington, 1990). Generally,

researchers have found around 35 to 45% of first-degree relatives of children with learning disabilities also have reading disabilities. They have also found evidence for approximately the same degree of familiality for speech and language disorders (Beichtman, Hood, & Inglis, 1992; Lewis, 1992) and spelling disability (Schulte-Korne, Deimel, Muller, Gutenbrunner, & Remschmidt, 1996).

Jamal

In the quote at the beginning of the chapter, Jamal's mother speculated that Jamal may have inherited his learning disability from his father. Over time, she found out that there was even more evidence that Jamal may have inherited his learning disability from his father's side of the family:

> I think it was about a year after Jamal's father, Robert, died. His family had a reunion, and we were all sitting around chatting about our childhoods. It was then that I found out that several of Robert's relatives had had learning problems of some kind or other, usually involving reading. His older brother, Clay, admitted that he still has problems reading. He figures that if he had been a kid, today, he'd have definitely been identified as learning disabled. But back then in the 1960s, in the school he was attending, they didn't have classes for students with learning disabilities. A couple of Robert's uncles also owned up that they, too, had had trouble with academics.
>
> *Irene Smith, Jamal's mother*

Familiality, however, is not proof of heritability. Learning disabilities may run in families for environmental reasons. For example, one cannot rule out the possibility that parents who have learning disabilities might cause their children to have learning disabilities by the way they raise them. Likewise, siblings may be more likely to have learning disabilities because they share relatively similar environments. In the case of Jamal, however, given the large number of family members with apparent learning disabilities, it is probably a good guess that his condition is inherited.

Heritability

heritability the degree to which a condition is genetically transmitted; often estimated by comparing the rate of the condition in monozygotic and dizygotic pairs of twins, one of whom has the condition

monozygotic twins twins from the same egg

dizygotic twins twins from two different eggs

The most common way to test for the **heritability** of a condition—the degree to which it is genetically transmitted—is to compare its prevalence in monozygotic (MZ) and dizygotic (DZ) twins. **Monozygotic twins** come from the same egg and share the same genetic characteristics; **dizygotic twins** come from two separate eggs and share the same genetic characteristics as do other siblings. In the case of reading disabilities, for instance, the researcher first finds a group of individuals with reading disabilities who are members of MZ twin pairs and compares them with a group of individuals with reading disabilities who are members of DZ twin pairs. If reading disability is heritable, the proportion of cases in which both twins are reading disabled should be higher in the MZ group than in the DZ group because the MZ twins come from the same egg and share more genetic material than do the DZ twins.

Researchers have consistently found a greater degree of concordance for reading disabilities and speech and language disorders in MZ twins than in DZ twins. For example, in a major study of genetics and learning disabilities, the Colorado

Reading Project, 53 of 99 (54%) MZ pairs and 23 of 73 (32%) DZ pairs were concordant for reading disabilities (DeFries, Gillis, & Wadsworth, 1993). In another study, 24 of 32 (75%) MZ pairs and 8 of 25 (32%) DZ pairs were concordant for speech and language disorders (Lewis & Thompson, 1992). In a study of MZ and DZ nondisabled readers, a high degree of heritability was also found on an oral reading measure (Reynolds et al., 1996).

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CEC Knowledge Check

Do you believe educators should communicate etiology of learning disabilities information to parents or not? If so, why? Or if not, why not?
CC10S10

Molecular Genetics

Researchers are also tackling the issue of whether specific genes can be identified with reading disabilities. It is the dream of many geneticists to isolate the gene or genes responsible for reading disabilities. But how realistic is this goal? After all, the human body contains approximately 30,000 genes (Human Genome Project Information, 2003). However, given the rapid advances in the field of molecular genetics, the goal appears more attainable than it did just a few short years ago. Considerable research has focused on the genes connected to two chromosomes in particular—Chromosome 6 and Chromosome 15. At this point, there is substantial reason to suspect that genes connected to these two chromosomes may play a role in the hereditary transmission of reading disabilities (Grigorenko, Wood, Meyer, & Pauls, 2000; Kaplan et al., 2002; Petryshen et al., 2001; Schulte-Korne, 2001).

As researchers hone in on particular genes responsible for reading disabilities, a whole host of ethical issues emerge. (See the Current Trends and Issues box on page 60.)

Teratogenic Factors

Teratogens are agents that can cause abnormal growth or malformation in the fetus. A variety of chemicals has been implicated as **teratogens.** We briefly discuss three of them: alcohol, cocaine, and lead.

teratogens agents that can cause abnormal growth or malformation in the fetus

Probably the most common teratogen affecting mental development is alcohol. A pregnant woman who drinks excessively runs the risk of having a baby with **fetal alcohol syndrome.** Although this is most often associated with mental retardation, brain damage, hyperactivity, anomalies of the face, and heart abnormalities, some have speculated that in smaller concentrations alcohol might result in more subtle neurological problems that lead to learning disabilities.

fetal alcohol syndrome a syndrome associated with mental retardation, brain damage, anomalies of the face, hyperactivity, and heart failure that affects children of women who drank alcohol excessively when pregnant

Some researchers have also concluded that crack cocaine use by expectant mothers can cause neurological damage in the developing fetus (Greer, 1990). Although not all authorities agree on whether crack cocaine results in learning problems, at this point, it is reasonable to be on the alert for learning disabilities and other behavioral problems in children born to mothers using crack cocaine.

We have long known that lead ingestion can result in brain damage. When lead-based paint was commonly used, researchers found that infants and young children who ate paint chips suffered brain damage and mental retardation (Byers & Lord, 1943; Smith, Baehner, Carney, & Majors, 1963). Lead-based paint is now banned, but researchers have been studying the effects of lower levels of lead that can result from living near lead smelters or other toxic sites. They have found that children exposed prenatally and postnatally to lead run the risk of exhibiting developmental problems (Feldman & White, 1992; Leviton et al., 1993; Minder, Das-Smaal, Brand, & Orlebeke, 1994).

CURRENT TRENDS & ISSUES

Reading Disabilities, Genes, and Ethical Issues

If researchers do find the gene or genes responsible for reading disabilities, this opens up the door for early diagnosis, even prenatally, of reading disabilities. As one researcher has put it:

> If dyslexia genes can be located, a molecular test of reading and spelling disorder would allow earlier diagnosis of children at risk. This in turn would offer the opportunity for very early intervention, at a time when the language areas are at an earlier, more plastic stage of development. (Schulte-Korne, 2001, p. 994)

Such early diagnosis, of course, also raises ethical issues. For example, might parents wish to abort a fetus because it has a defective gene or genes for reading? Or might parents wish to take advantage of some kind of gene replacement therapy if it was available? These same issues have been raised with respect to the area of mental retardation. The following is an excerpt of a speech delivered to Arc, a major parent organization for persons with mental retardation, but it is also applicable to learning disabilities.

> A number of arguments are offered against gene therapy, including the concern about the potential for harmful abuse if we don't distinguish between good and bad uses of gene therapy. The eugenics movement of the 1920s to the 1940s found people with mental retardation being involuntarily sterilized. . . . Another concern is that in mental retardation gene-therapy research, many candidates are likely to be children who are too young or too disabled to understand ramifications of the treatment. Finally, gene therapy is very expensive and may never be sufficiently cost-effective to merit high social priority. Opponents say that if those who can afford gene therapy are the only ones to receive it, the distribution of desirable biological traits will widen the differences among various socioeconomic groups. (Davis, 1997)

As with almost any advance in technology that affects human lives, the issues are complex and challenging. As research closes in on finding specific genetic conditions that may cause learning disabilities, researchers and practitioners will need to be vigilant to potential abuses.

Council for Exceptional Children

CEC Knowledge Check

If a reading disability or dyslexia gene were found, would the benefits outweigh the possible misuse? What would be some of the ethical misuses of gene therapy? What should be the response of the LD professional?
CC1S1, LD2K1, LD2K2, LD9S2

Medical Factors

There are myriad medical conditions that can contribute to children's problems. The following are sometimes associated with learning disabilities:

- *Premature birth* places children at risk for neurological damage, learning disabilities, and other disabling conditions. One study found that 19% of prematurely born children with very low birthweight had learning disabilities (Ross, Lipper, & Auld, 1991).
- *Diabetes* can lead to neuropsychological problems and learning disabilities. One team of authorities concluded that children with early onset of diabetes (before 5 years of age) are candidates for learning disabilities (Rovet, Ehrlich, Czuchta, & Akler, 1993).
- *Meningitis,* an infection of the brain caused by a variety of viral or bacterial agents, can result in brain damage. There is evidence that this brain damage can lead to learning problems (Taylor & Schatschneider, 1992).
- *Cardiac arrest,* although occurring rarely in children, can lead to loss of oxygen and blood flow to the brain, which results in brain damage. Children who had suffered a cardiac arrest were found to have a variety of deficits on neuropsychological, achievement, and adaptive behavior measures (Morris, Krawiecki, Wright, & Walter, 1993).

- *Pediatric AIDS* is rapidly becoming the major infection that babies can contract from their mothers (Armstrong, Seidel, & Swales, 1993). The effects of pediatric AIDS are not always easy to disentangle from other social and physical causes (e.g., neglect, malnutrition, drug and alcohol addiction), but there is strong evidence that pediatric AIDS can result in neurological damage.

Council for Exceptional Children

CEC Knowledge Check

There are a number of serious medical factors associated with learning disabilities. Brainstorm what additional effects these conditions can have on a child's life and on the rest of the family. CC3K1, LD2K2

Environmental Factors

The role the environment may play in causing learning disabilities has already been noted. For example, extremely poor parenting or teaching can put children at risk for developing learning difficulties. In addition to having a direct negative influence on learning, the environment can also have an indirect impact on learning by creating situations in which brain dysfunction is more likely. Poor socioeconomic conditions are linked with a host of factors (e.g., malnutrition, poor prenatal and postnatal health care, teenage pregnancy, substance abuse) that can put children at risk for neurological dysfunction. And, unfortunately, there is strong evidence that, since the mid to late 1970s, increasing numbers of children and their mothers are living in poverty.

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CEC Knowledge Check

Looking back at the USOE definition, if you believe in the "nurture" philosophy of etiology, what factors might cause you to mislabel a child with the label "learning disabled"? LD2K1, LD8K2

What Should Educators Keep in Mind Regarding Causes?

From an educator's viewpoint, it is important to keep the significance of causal factors in its proper perspective. Knowing the exact cause of a learning disability is of only limited utility to teachers and other educators. For example, knowing that a particular student does or does not have neurological dysfunction is largely irrelevant to how one teaches that student. Furthermore, in considering individual cases, we are rarely able to determine definitively the cause or causes of someone's learning disability because there are no foolproof tests, procedures, or examinations that provide quick and easy answers to the complicated question of causal factors. Nonetheless, as well-rounded professionals able to communicate with professionals from other fields, as well as with parents, teachers have a responsibility to keep abreast of research on causal factors of learning disabilities.

PORTFOLIO-BUILDING ACTIVITY

Demonstrating Mastery of the CEC Standards

Use the information you have learned in this chapter to refine your Personal Philosophy of Special Education paper in the area of learning disabilities, which you started in Chapter 1. Revise your draft to demonstrate your perspectives on the following issues:

- Discuss the historical and philosophical contributions of neurological (nature) versus behavioral/environmental (nurture) perspectives, including its three major contributors (Hinshelwood, Orton, and Myklebust).
- Discuss your philosophical position regarding the etiology of learning disabilities (i.e., nature versus nurture).

Council for Exceptional Children

CEC Content Standards

1. Foundations
2. Development and Characteristics of Learners
3. Individual Learning Differences

- Relate why it is important for you as an educator to understand learning disability etiology and relationships in your interactions with students and families.
- Describe how technology and research advancement may affect future definitions and identification procedures.

SUMMARY

What causes learning disabilities?

- The field of learning disabilities grew out of a medical and clinical assumption that neurological factors were the basis of learning disabilities. The work of Broca and Wernicke in the 19th century, which identified particular areas of the brain as controlling speaking and understanding of language, laid the groundwork for later work on dyslexia. In the early 20th century, clinicians noted the similarities between children with dyslexia or other learning disabilities and persons with documented brain damage.
- The field was slow to accept neurological dysfunction as a viable causal factor because of the questionable accuracy of neurological measures and the popularity of behaviorism and environmentalism.
- In recent years, professionals have generally taken a more favorable view of neurological explanations of learning disabilities. There has been a decrease in the popularity of behaviorism and environmentalism because intervening to remedy the effects of poverty on child development has been difficult. Furthermore, advances in neurological measures, such as MRIs, PET-scans, and fMRIs, have probably been the most influential reason for the resurgence of interest in exploring neurological factors in learning disabilities.

How does the brain function?

- Neurons send and receive messages. Neurons consist of a soma (cell body), dendrites (projections that receive messages), and an axon, with its terminal buttons that secrete chemical neurotransmitters into the synapse (a small gap between the axon and dendrite).
- Different parts of the brain have different functions. The brain is commonly divided into the following areas, each of which is generally responsible for different functions:
  - brain stem—regulates survival reflexes such as heart rate and respiration
  - cerebellum—regulates several behaviors related to movement, including balance, gait, speech, and eye movements
  - cerebral cortex—composed of the frontal lobes (responsible for some motor movements and executive functions), prefrontal lobes (foreparts of the frontal lobes that are implicated in control of emotions), parietal lobes (involved in the integration of bodily sensations and visual perceptions), occipital lobes (primarily dedicated to visual perception, in conjunction with other parts of the brain), and temporal lobes (involved in attention, memory, and language production and reception)
- The left and right hemispheres of the brain are relatively distinct with regard to their functions. For the most part, each receives information and controls movement of the opposite side of the body. In most people, especially those who are right-handed, the left hemisphere is more important for language production and comprehension than the right hemisphere.
  - Broca's area and Wernicke's area are two parts of the left hemisphere associated with language (production and comprehension, respectively). However, damage to these areas does not always result in the same kinds of problems, and there is evidence that the right side of the brain is responsible for some aspects of language and communication.
  - Split-brain studies involve surgical procedures performed on patients with severe epilepsy in which the number of seizures experienced is reduced by severing the area between the two hemispheres. These studies have resulted in dramatic demonstrations of the differential abilities of the two hemispheres.

How can we infer neurological dysfunction in children?

- Historically, neurological dysfunction in children with learning disabilities has been largely inferred from what we know about the behavior of people with documented brain injury. This approach has its limita-

tions, however, because it does not involve direct measures of brain function or structure.

- More recently, researchers, using postmortem studies and neuroimaging technology (MRI, PET-scan, and fMRI) comparing persons with and without dyslexia, have concluded that
  - the left hemisphere of the brain is more often the site of the dysfunction. However, some researchers have also found differences in the right hemisphere between persons with and without dyslexia.
  - research has been fairly, but not totally, consistent in pointing to dysfunction in the following locations of the brain: Broca's area, planum temporale, Wernicke's area, angular gyrus (an area immediately behind Wernicke's area).
  - research has been less consistent in pointing to the following locations as dysfunctional: occipital lobes, parietal lobes (see Figure 2.2, page 49), corpus callosum (a band of nerve fibers that connects the two hemispheres of the brain).
- Even though many researchers have pointed to the left hemisphere as involved in learning disabilities, there is also evidence that a dysfunctional right hemisphere may be the cause of nonverbal learning disabilities. Nonverbal learning disabilities may include difficulties with visual-spatial and tactual tasks, math, and self-regulation and organization. The most significant problems for people with nonverbal learning disabilities may be in the social area, in which they may exhibit poor social perception and judgment.

What factors contribute to neurological dysfunction?

- Hereditary factors may play a role. Researchers have used two types of studies to investigate the genetic basis of learning disabilities:
  - Familiality, in which a learning disability occurs at a greater than chance rate in a family, has been found in some studies. But familiality is not proof of heritability, because learning disabilities may occur in a family for environmental reasons.
  - Heritability studies often compare the prevalence of a condition in monozygotic versus dizygotic twins. MZ twins share more genetic material than do DZ twins. If learning disabilities are inherited, when one twin has learning disabilities, there should be more cases of the other twin also having learning disabilities in MZ than in DZ twins. Research has consistently found this to be the case.
- Teratogenic factors may play a role. Teratogens are agents that cause abnormal growth or malformation of the fetus. The following are some examples:
  - Alcohol is probably the most common teratogen that can affect mental development. Authorities speculate that fetal alcohol syndrome, although most often associated with mental retardation, may result in learning disabilities if the alcohol is in smaller concentrations.
  - Crack cocaine use by expectant mothers may also cause neurological damage to a developing fetus, but opinions vary about long-term exposure as a cause of learning disabilities.
  - Ingestion of lead can result in brain damage, and we cannot rule out prenatal exposure as a cause of some cases of learning disabilities.
- Medical factors may play a role. Some examples are premature birth, diabetes, meningitis, cardiac arrest, and pediatric AIDS.
- Environmental factors can have an indirect effect on neurological development by creating situations in which brain dysfunction is more likely to occur. For example, poor socioeconomic conditions are linked to many factors that put children at risk for neurological disorders.

What should educators keep in mind regarding causes?

- In individual cases, we are rarely able to determine definitively the cause of someone's learning disability.

REFLECTIONS ON THE CASES

1. Should Jamal's mother inform him of the possible hereditary basis of his condition? What advice, if any, should she give him?
2. How important is it for teachers to know the causes of Jamal's and Shannon's learning disability?