Chapter 12

Rethinking Learning Disabilities

G. Reid Lyon, Jack M. Fletcher, Sally E. Shaywitz, Bennett A. Shaywitz, Joseph K. Torgesen, Frank B. Wood, Ann Schulte, and Richard Olson

Introduction

This report is about learning disabilities (LD), the most frequently identified class of disabilities among students in public schools in the United States. Despite its apparently high—and rising—incidence, LD remains one of the least understood and most debated disabling conditions that affect school-aged children (and adults). Indeed, many disagree about the definition and classification of LD; the diagnostic criteria and assessment practices used in the identification process; the content, intensity, and duration of instructional practices employed; and the policies and legal requirements that drive the identification and education of those with LD.[1]

Given what is now known about LD, it is irresponsible to continue current policies that dictate inadequate identification practices.

We take the position that many of these debates can be informed by converging scientific data. On the basis of this evidence, we contend that many of the persistent difficulties in developing valid classifications and operational definitions of LD are due to reliance on inaccurate assumptions about causes and characteristics of the disorders. Furthermore, we argue that sufficient data exist to guide the development and implementation of early identification and prevention programs for children at-risk for LD, particularly reading programs that can benefit many of these youngsters.

We contend that sound prevention programs can significantly reduce the number of older children who are identified as LD and who typically require intensive, long-term special education programs. Moreover, prevention programs will prove more effective than remedial programs. Finally, we contend that, given what is now known about LD, it is irresponsible to continue current policies that dictate inadequate identification practices. Instead, we must develop evidence-based alternatives, specific strategies to implement these alternatives, and a research and policy agenda to ensure that these changes are phased into practice as quickly as possible.

In this chapter, we offer alternatives to traditional identification, assessment, and educational strategies for children with LD, alternatives that close the gap between research and practice. We provide a description of the specific instructional needs of children whose low academic

achievement can be strengthened by informed teaching.

The chapter is organized into three sections. In the first, we present the current federal definition of LD and trace the theoretical, clinical, and political bases for its construction.[2]

In the second section, we summarize a body of converging research on reading development, reading disabilities (RD), and reading instruction that underscores the importance of early identification and prevention intervention programs to reduce reading failure among many children at-risk for limited literacy development. Although RD represents only two (LD in basic reading skills; LD in reading comprehension) of the seven types of LD that can be identified according to federal law, our focus on RD is predicated on three facts. First, approximately 80 percent of children with LD have primary difficulties with reading.[3] Second, learning to read is essential for academic achievement and accomplishment in all subjects. Third, more is known about deficiencies in reading than about any other academic domain affected by LD, and much of what is known can effectively impact policy and instruction.[4]

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We have chosen to combine the following within the RD designation: (1) those children who meet criteria for LD and typically receive services through special education; and (2) those who read below the 25th percentile but do not qualify for the diagnosis of LD and often receive services through compensatory education. Our decision to combine the two groups is predicated on data indicating little difference between them in the proximal causes of their reading difficulties. We estimate that the number of children who are typically identified as poor readers and served through either special education or compensatory education programs (as well as children with significant reading difficulties who are not formally identified and served) could be reduced by up to 70 percent through early identification and prevention programs.

In the third section, we examine a number of issues that should be considered when addressing the educational needs of children at risk for learning failure and children identified as LD at later ages. Under current policies and practices, the number of older children identified as LD continues to increase without concomitant improvements in their learning abilities. We explain why this is the case and provide alternatives for meeting the educational needs of these students.

Finally, we are mindful of the complexity of translating research findings into policy and practice. Policy can have unintended outcomes. Evidence-based alternatives can have few benefits or even harmful effects if implementation strategies are not informed by a clear understanding of specific needs for capacity building at the teacher, school, and system levels. In response, we outline a series of short- and long-range initiatives designed to optimize instruction for all students.

Definitions of Learning Disabilities

What is a Learning Disability?

The term *learning disability* (LD) is traditionally synonymous with the concept of *unexpected underachievement*—specifically, students who do not listen, speak, read, write, or develop mathematics skills commensurate with their potential, even though there has been adequate opportunity to learn. Historically, unexpected underachievement has been attributed to intrinsic neurobiological factors that indicate that students with LD will require specialized instruction to achieve at expected levels based upon some index of aptitude, usually an IQ test score.[5]

The concept of unexpected underachievement has been reported in medical and psychological literature since the mid-19th century under the rubrics of dyslexia, word blindness, dysgraphia, dyscalculia, and other terms.[6] However, it has only been since 1962, when Samuel Kirk, a psychologist at the University of Illinois, coined the term *learning disabilities*, that the concept of unexpected underachievement attained formal recognition in the education community. Kirk used the term to refer to a variety of syndromes affecting language, learning, and communication; like his more medically oriented predecessors, he felt that LD reflected unanticipated learning problems in a seemingly capable child. Writing in 1962, Kirk defined LD as "a retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, spelling, writing, or arithmetic resulting from a possible cerebral dysfunction and not from mental retardation, sensory deprivation, or cultural or instructional factors."[7] Speaking at a 1963 conference, Kirk further noted that LD represented a discrepancy between a child's achievement and his or her apparent capacity to learn. As in the current federal definition, Kirk recognized that LD represented an amalgam of disabilities, all grouped under a single label. He did not feel that the term was synonymous with RD.[8] However, RD was the most frequently identified type of LD in Kirk's day, as today.

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The term *learning disability* gained rapid acceptance in the 1960s and 1970s because it addressed a critical need of concerned parents and professionals. The concepts represented by LD also made educational sense.[9] Previously, children whose failure to learn could not be explained by mental retardation, visual impairments, hearing impairments, or emotional disturbance were disenfranchised from special education. Their learning characteristics simply did not correspond to existing categories of special education. Thus, the needs of these children were not being met by the educational system; it was through parental and professional advocacy efforts that special education services were ultimately made available for them through the 1969 Learning Disabilities Act.[10] The same legislative language later appeared in the Education for All Handicapped Children Act of 1975 (EAHCA), now the Individuals with Disabilities Education Act (IDEA).[11]

The concept of *learning disabilities* and the need for different specialized educational services also made intuitive sense to parents, teachers, and policymakers. The term did not stigmatize children. Specifically, the learning difficulties displayed by youngsters with LD were not due to

mental retardation, poor parenting, or psychopathology. The term likewise reflected optimism. Students with LD had not yet reached their potential: Their difficulties in learning to read, write, and/or calculate occurred despite adequate intelligence, sensory integrity, healthy emotional development, and cultural and environmental advantage. Education programs were needed that recognized differences among children with LD, those who learned "normally," and those who manifested physical, sensory, and intellectual handicaps that affected academic achievement.

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This view of educational need continues to maintain considerable currency. Since the mid-1970s, when the EAHCA first required an accounting of the number of children with LD identified and served in public schools, the number of children served has increased from 1.8 percent of school-aged students (1976-1977) to almost 5.2 percent in 1997-1998. Moreover, in 1976-1977, students with LD comprised 22 percent of school-aged students in special education programs; in 1997-1998, the percentage came closer to 52 percent. In just the past 10 years, the number of students ages 6-21 identified as LD under the IDEA has increased 38 percent, with the largest increase (44 percent) among students between 12 and 17 years of age. These increases are not limited to public schools. The number of students identified with LD that attend private schools and post-secondary institutions has increased by similar proportions in the same time period.[12]

Few would disagree that 5 percent or more of our school-age population experience difficulties with language and other skills that would be disruptive to academic achievement, or that the factors that led to the concept of LD have lost their salience. The concept of LD is valid, and there are many children and adults whose difficulties in learning are indeed the result of genuine learning disabilities. The issues we raise involve whether classifications used for LD identify *all* children who would benefit from special education services and/or specialized instruction. Similarly, we ask whether younger children who have severe (difficult to remediate) forms of LD are being adequately served given identification rates that point toward disproportionate representation of older children within this category.

What underlies this disproportionate increase in the prevalence of children with LD, particularly in the 12-17 age range? Is it because of improvements in diagnostic and identification practices, or are other factors at work? Is the definition of LD that guides assessment and diagnostic practices too general and ambiguous to ensure accurate identification of younger students? Are the constructs and principles inherent in the definition of LD even valid? Are diagnostic practices biased against the identification of younger, poor, or ethnically different children with LD? Are some students identified as LD actually underachieving in school because of poor teaching and inadequate services? Or has the education profession failed to tolerate individual differences in learning and to properly train regular teachers and special educators to address these differences? Is teacher preparation an issue in the emergence of a child as LD?

Such questions must be answered honestly for the sake of our nation's children. We believe some of the answers can be found through close examination of the features that comprise the

Table 1. Federal definition of learning disabilities

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.

(a) A team may determine that a child has a specific learning disability if:

(1) The child does not achieve commensurate with his or her age and ability levels in one or more of the areas listed in paragraph (a) (2) of this section, when provided with learning experiences appropriate for the child's age and ability levels; and

(2) The team finds that a child has a severe discrepancy between achievement and intellectual ability in one or more of the following areas: (i) Oral expression; (ii) Listening comprehension; (iii) Written expression; (iv) Basic reading skill; (v) Reading comprehension; (vi) Mathematics calculation; or (vii) Mathematics reasoning.

Sources: Assistance to States for the Education of Children with Disabilities Program and Preschool Grants for Children with Disabilities Final Rule, 34 C.F.R. pts. 300, 301 (1992); see also note 2.

current definition(s) of LD, as well as those that preceded it. We also propose that the disproportionate increase in the numbers of older children identified as LD during the late elementary to middle school years is, in part, attributable to the following: (1) the limited effectiveness of remediation after age nine; (2) measurement practices that are biased against the identification of children before age nine; and (3) socio-educational factors operating within the public school enterprise. Within this context, we have organized the rest of this section to address the scientific integrity of major themes that guide identification and instructional practices in the field of LD. We conclude it with an examination of the function of the current LD category within the larger educational enterprise and the effects of this function on education policies and practices, particularly those involving the definition of LD. It is important to point out that many of the concerns we address in this chapter (for example, the overuse and over-interpretation of discrepancy data, as well as the misinterpretation of disclaimers in the exclusion language of the IDEA) frequently reflect misinterpretation of the actual regulatory language in the IDEA by schools determining eligibility for special education. Nevertheless, these concerns are frequently cited and are predicated on less than optimal translation of the federal law into identification practices at the school level.

The Critical Conceptual Elements Within Definitions of LD

The federal definition of LD (see Table 1) has four conceptual elements that are common across a number of definitions of LD.[13] These elements are (1) the heterogeneity of LD; (2) its

intrinsic/neurobiological nature; (3) a significant discrepancy between learning potential (typically assessed by measures of intelligence) and academic performance (typically assessed by measures of reading, writing, mathematics, and oral language skills); and (4) the exclusion of cultural, educational, environmental, and economic factors, or other disabilities (mental retardation, visual or hearing impairments, emotional disturbance) as causes of LD. Despite the ubiquity of these elements in LD definitions, their validity is rarely examined.

The Heterogeneity Element

As defined in federal legislation, LD is not a single disability but a general category of special education composed of disabilities in any one or a combination of seven skill domains: (1) listening; (2) speaking; (3) basic reading (decoding and word recognition); (4) reading comprehension; (5) arithmetic calculation; (6) mathematics reasoning; and (7) written expression. Disabilities in these areas frequently occur together and can also be accompanied by emotional, social, and behavioral disorders, including disorders of attention. However, these companion conditions cannot be the *primary* cause of the LD.

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Although the inclusion of these seven areas of disability in current definitions ensures that an expansive diagnostic net can be cast around a wide range of learning difficulties, heterogeneity within and across each academic domain renders diagnostic precision impossible. There are, by and large, different forms of LD. Their characteristics and learning needs vary. Reading and mathematics disorders, for example, vary along multiple dimensions. There is little evidence that the precise causes of different forms of LD are the same, so treating them as seven separate, heterogeneous disorders makes sense. However, we presently have one definition for all of these forms of LD. In the future, separate evidence-based definitions for each of these disabilities should be developed to enhance the assessment and instruction of children with different forms of LD.[14]

The Intrinsic/Neurobiological Element

The field of LD was founded on the assumption that neurobiological factors are the basis of these disabilities. In the main, neurobiological dysfunction was inferred from what was then known about the linguistic, cognitive, academic, and behavioral characteristics of adults with documented brain injury, as well as the observation that reading problems ran in families. As the field progressed, definitions of LD continued to attribute disabilities in learning to intrinsic (neurobiological) rather than extrinsic (for example, environmental or instructional) causes, even though there was initially no objective way to assess the presence of putative brain dysfunction.[15]

Neurobiological factors have been most closely studied in the area of reading. A considerable body of evidence indicates that poor readers exhibit disruption primarily, but not exclusively, in the neural circuitry of the left hemisphere serving language. Both a range of neurobiological investigations using postmortem brain specimens and, more recently, quantitative assessment of brain anatomy using magnetic resonance imaging (MRI) suggest that there are subtle *structural* differences in several brain regions between RD and nonimpaired readers. Converging evidence

from neuroimaging modalities that measure brain *function* (for instance, a functional MRI) indicates a pattern of brain organization in RD that is different from nonimpaired readers. Specifically, these studies show reductions in brain activity while performing reading tasks usually, but not always, in the left hemisphere.[16]

Of particular interest from the studies of brain function is the possibility that the resultant neural circuitry reflects not only the individual's biological makeup, but also environmental influences. Central among these influences is how reading instruction impacts brain circuitry. The findings suggest that neural systems develop and are deployed for specific cognitive functions through the interaction of the brain and the environment (including instruction).

This "interaction" perspective is supported by genetic studies of individuals with RD. It has long been known that reading problems recur across family generations, with a risk in the offspring of a parent with RD eight times higher than the general population. Studies with identical and fraternal twins have shown that a significant portion of this familial risk is due to genetic factors. Yet such factors account for only about half of the variability in reading skill development; environmental factors account for the other half and therefore have a significant influence on reading outcomes. Thus, what may be inherited is a susceptibility for RD that may manifest itself given specific interactions, or lack thereof, with the environment. For example, parents who read poorly may be less likely to read to their children. The quality of reading instruction provided in the school may be most critical for children when there is a both a genetic risk for poor reading and a family situation giving rise to limited instructional interactions in the home.[17]

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The Discrepancy Element

No definitional element has generated as much controversy as the use of IQ-achievement discrepancy in the identification of students with LD.[18] When resources (funding) are limited, a valid classification must give rise to operational criteria that can guide the reliable identification of individual cases. Indeed, the adoption of the concept of an IQ-achievement discrepancy as only one, but clearly the primary, operational criterion commenced in 1977, shortly after passage of the EAHCA, to "objectively and accurately" distinguish the child with LD from children with other academic deficiencies.[19]

When the EAHCA was enacted in 1975, states reported that the definition of LD provided insufficient criteria for identifying eligible children. In response, the Office of Education developed more explicit criteria for eligibility and published guidelines for identification which included a severe discrepancy between achievement and intellectual ability (see Table 1). These criteria maintained the heterogeneity and exclusionary elements of the 1969 definition, but added the IQ-discrepancy component as an additional criterion. Inherent in this criterion is an implicit classification of low-achieving students into those who are LD (those with unexpected underachievement) and those who simply underachieve (those with expected underachievement).

The idea of using an IQ-achievement discrepancy metric as one way to "objectively determine"

the presence or absence of LD was probably reasonable at the time. Long before "severe discrepancy" became synonymous with LD, practitioners had been intrigued by the seemingly paradoxical inability of some children of average and superior intelligence to master academic concepts. Following repeated reports of this phenomenon in the literature, clinicians and researchers saw value in distinguishing between a subset of low achievers who displayed pervasive limitations in cognitive ability (for example, students with mild mental deficiency) and a subgroup of children with academic deficits displayed against a background of normal intelligence.[20]

The notion of using an IQ-achievement discrepancy as a marker for unexpected underachievement was also consistent with the still-prevailing, albeit inaccurate, view that IQ scores were robust predictors of an individual child's ability to learn. Given this view, children who displayed a gap or discrepancy between their measured IQ and their achievement in oral language, reading, writing, and/or math were viewed as not achieving at levels commensurate with their potential. Thus, despite admonitions by R. L. Thorndike and others throughout the 20th century that IQ scores reflect primarily a gross estimate of *current* general cognitive functioning and should not be used as a measure of *learning potential*,[21] the idea of an IQ-achievement discrepancy as a meaningful diagnostic marker for LD was accepted in policy and practice in 1977 and has been in general use ever since.

The IQ-achievement discrepancy, when employed as the primary criterion for the identification of LD, may well harm more children than it helps.

There are many problems with the concept of an IQ-achievement discrepancy. It not only embodies sometimes naive and erroneous assumptions about the adequacy of an IQ score as an index of learning potential, but the actual comparison of academic achievement scores with IQ scores to derive a discrepancy value is fraught with psychometric, statistical, and conceptual problems that render many comparisons useless.[22] Of even greater significance, the IQ-achievement discrepancy, when employed "inappropriately" as the primary criterion for the identification of LD, may well harm more children than it helps. Not only do discrepancy formulas differ from state to state, making it possible for a student to lose special education services following a family move, but also reliance on a measurable discrepancy between IQ and achievement makes early identification of LD difficult. An overreliance on discrepancy means that children must fail or fall below a predicted level of performance before they are eligible for special education services. Because achievement failure sufficient to produce a discrepancy from IQ cannot be reliably measured until a child reaches approximately nine years of age, the use of IQ-discrepancy constitutes a "wait-to-fail" model.[23] Thus, the student has suffered the academic and emotional strains of failure for two to three years before potentially effective instruction can be brought to bear. This order of events has devastating, lifelong consequences. In the area of RD, epidemiological data show clearly that the majority of children who are poor readers at age nine or older continue to have reading difficulties into adulthood.[24]

Another potentially serious flaw in the use of an IQ-achievement discrepancy metric concerns the unsystematic and frequently inequitable provision of educational services and accommodations based on the presence or absence of a discrepancy. Because there is no

strong evidence that the IQ-achievement discrepancy criterion either (1) describes an intrinsic reading-related processing difference within low achieving readers (nondiscrepant versus discrepant), or (2) provides a differential prediction of response to intervention or educational outcomes, the use of such discrepancy requirements to deny specialized services and/or accommodations to nondiscrepant poor readers is arbitrary and problematic.[25]

In the area of RD, the issue is further complicated when some individuals score in the average range on word reading tasks but exhibit significant difficulties when reading connected text. Here, their reading comprehension is impaired primarily because they read slowly. These individuals are disabled in reading and clearly require specialized instruction and accommodations. They do not receive such instruction and accommodations because reading fluency is rarely assessed in current identification procedures. If a slow-reading student scores significantly above the average range on a measure of intelligence, services may be afforded on the basis of the discrepancy between the average untimed word reading score and the above-average IQ score. However, slow-reading students who score within the average range on both the untimed reading measures and the IQ test will typically be denied services because there is no discrepancy—even though they also have a disability that requires specialized services and/or accommodations. The bottom line is that the IQ-achievement discrepancy formulation provides access to services for only some individuals and sometimes denies services without appropriately measuring the fundamental problem.

No child is born a reader; all children in literate societies have to be taught to read.

In sum, the use of an IQ-achievement discrepancy to identify children with LD appears to move many students further away from the education they need. Because the discrepancy hinges on the IQ level of students rather than on their specific academic needs, the emphasis is on eligibility rather than instruction. This situation reflects the orientation of special education in public schools toward compliance with federal regulations rather than positive educational outcomes. Such an emphasis is unfortunate since we have little evidence that the special education remediation services provided to children with LD help them catch up to their peers in academic skills. This issue is addressed below.

The Exclusion Element

Most definitions of LD have an exclusion clause, stating that LD is not the primary result of other conditions that can impede learning. These other conditions include mental retardation; emotional disturbance; visual or hearing impairments; inadequate instructional opportunities; and cultural, social, or economic conditions. Given the primacy of the exclusion element within definitions of LD (in combination with the discrepancy element), many children identified as LD have been diagnosed on the basis of what they are not, rather than what they are.[26] This is unfortunate for three major reasons. First, identifying children with LD on the basis of exclusions downplays the development of clear inclusionary criteria. Second, an exclusionary definition is a negative definition that adds little conceptual clarity and clearly constrains understanding LD to its fullest extent. As Michael Rutter has argued,[27] this approach to definition suggests that if all known causes of the disorder can be excluded, the unknown (in the form of LD) can now be invoked. Third, and most important, many of the conditions excluded as potential influences on LD are themselves factors in impeding the development of cognitive and linguistic skills that lead

to the academic deficits frequently observed in RD children.

One exclusion criterion for LD that is especially difficult to reconcile is the student's instructional history. All definitions of LD exclude children from consideration if their learning problems are primarily a product of inadequate instruction. Of all the different assumptions in the concept of LD, this one is the least examined yet perhaps the most important. Some would interpret this exclusion feature to indicate that children who profit from instruction do not have a biologically based LD, yet functional imaging studies suggest that in the area of reading this is not so. Instruction may be necessary to establish the neural networks that support reading. No child is born a reader; all children in literate societies have to be taught to read. The ability to read and write is explicitly built upon our natural capacities for developing oral language.[28]

From its inception as a category, LD has served as a sociological sponge that attempts to wipe up general education's spills and cleanse its ills.

Similarly, most definitions exclude children from the LD category whose learning difficulties may be primarily related to environmental, cultural, or economic disadvantage. Yet these very conditions place some children at significant risk for weaker neural development and secondary learning difficulties. Given the emphasis within current definitions of LD on the causal role of the central nervous system in academic skills disorders, it seems unwise to reject the possibility that the environment (including social and cultural factors) can affect brain development and function, and thus affect learning. Poor socio-economic conditions are related to a number of factors—including malnutrition, limited pre- and post-natal care, exposure to teratogens and substance abuse—all of which can place children at risk for neurological dysfunction, leading to cognitive, linguistic, and academic deficits.[29]

In sum, the brain and the environment operate in reciprocal fashion, pushing or limiting development according to the frequency, timing, and quality of the interactions. To exclude children from specialized services because of instructional, environmental, social, and cultural factors ignores the importance of these factors in shaping the central nervous system and the child's cognitive and linguistic repertoire. Many lives can be improved significantly by identifying those children most susceptible to possible cognitive and academic difficulties. These children need the best instruction at the earliest possible time. To do this will require reconsideration of current definitions of LD. Unfortunately, this is easier said than done because of the sociological role that LD has come to play within the larger educational enterprise.

LD's Sociological Function

Discussions of LD frequently become mired in attempts to explain frequent inconsistencies in definitions, identification practices, and instructional needs of children with the disorder. Some critics of the LD diagnostic concept argue that the category is a "catch-all" for low-achieving students who don't fit anywhere else within the special education system. However, these arguments fail to address the real reasons the category has expanded exponentially in the last three decades. To paraphrase Gerald Senf's analysis,[30] from its inception as a category, LD has served as a sociological sponge that attempts to wipe up general education's spills and cleanse its ills. Today's classrooms are heterogeneous and teachers are expected to address a wide

range of individual differences in cognitive, academic, and behavioral development. Unfortunately, many regular classroom teachers have not been trained to accommodate different students' learning needs, and they understandably seek assistance that typically takes the responsibility of educating the child away from the classroom teacher.[31]

There is no doubt that, because of limitations in training, many general education and special education teachers are not prepared to address and respond to these individual differences in an informed manner. For example, a large number of teachers report that their training programs did not adequately prepare them to impart effective reading instruction, particularly to children with limited oral language and literacy experiences or to children with the most severe forms of reading disabilities.[32] This is a significant concern, given that many children at risk for reading failure come from disadvantaged backgrounds, where early childhood education and preschool experiences are less available. Many of these children fail to read because they did not receive effective instruction in the early grades. Some may then, in later grades, require special education services to make up for this early failure in reading instruction.

Senf's metaphor is particularly apt as one observes the "sponge" expand or contract when standards for academic accountability stiffen, demographics of school communities change, administrative concerns increase because LD students are being over- or under-identified, or parental pressures are brought to bear on behalf of their struggling children. In general, the LD sponge has expanded since the advent of the EAHCA because it has been able to absorb a diversity of educational, behavioral, and socioemotional problems irrespective of their causes, their responses to good teaching, or their prognosis.

Children who get off to a poor start in reading rarely catch up. We wait—they fail. But it does not have to be this way.

The effects of these practices on our scientific understanding of LD have been devastating and insidious. It is important to understand that, for the most part, knowledge about LD has been obtained by studying heterogeneous samples of children identified by their schools as LD without attention to how or why the diagnosis was applied. The differences observed within and across samples have been so extensive that the research data are often difficult to interpret.

Where Do We Go From Here?

The current federal definition of LD is conceptually weak. The inclusionary criteria (such as the IQ-achievement discrepancy criterion) and most exclusionary criteria do not appear to be valid markers for LD. The primary use of the IQ-achievement discrepancy criterion comprises a "wait to fail" model: many children cannot be reliably identified as LD and begin to receive specialized services until approximately third grade because of the psychometric limitations inherent in the use of discrepancy formulas. All of this reflects the emphasis within special education on compliance as opposed to results. In the next section, we show that the results of remedial services for children with LD in reading are poor.

We contend, therefore, that it is not in the best interest of children to continue to use present policies and practices as the primary means to provide appropriate instruction to children with LD, particularly students with reading difficulties. A strong statement? Yes, but it is one that is

based on research indicating that, without early intervention, the poor first-grade reader almost invariably becomes a poor middle school reader, high school reader, and adult reader. In short, children who get off to a poor start in reading rarely catch up. We wait—they fail. But it does not have to be this way. It is a tragedy that both general and special education practices and policies continue unchanged even as extensive converging evidence makes clear that one major solution to the problem of school failure in general, and reading failure in particular, is early identification and prevention.

Figure 1. Growth in Reading Skills

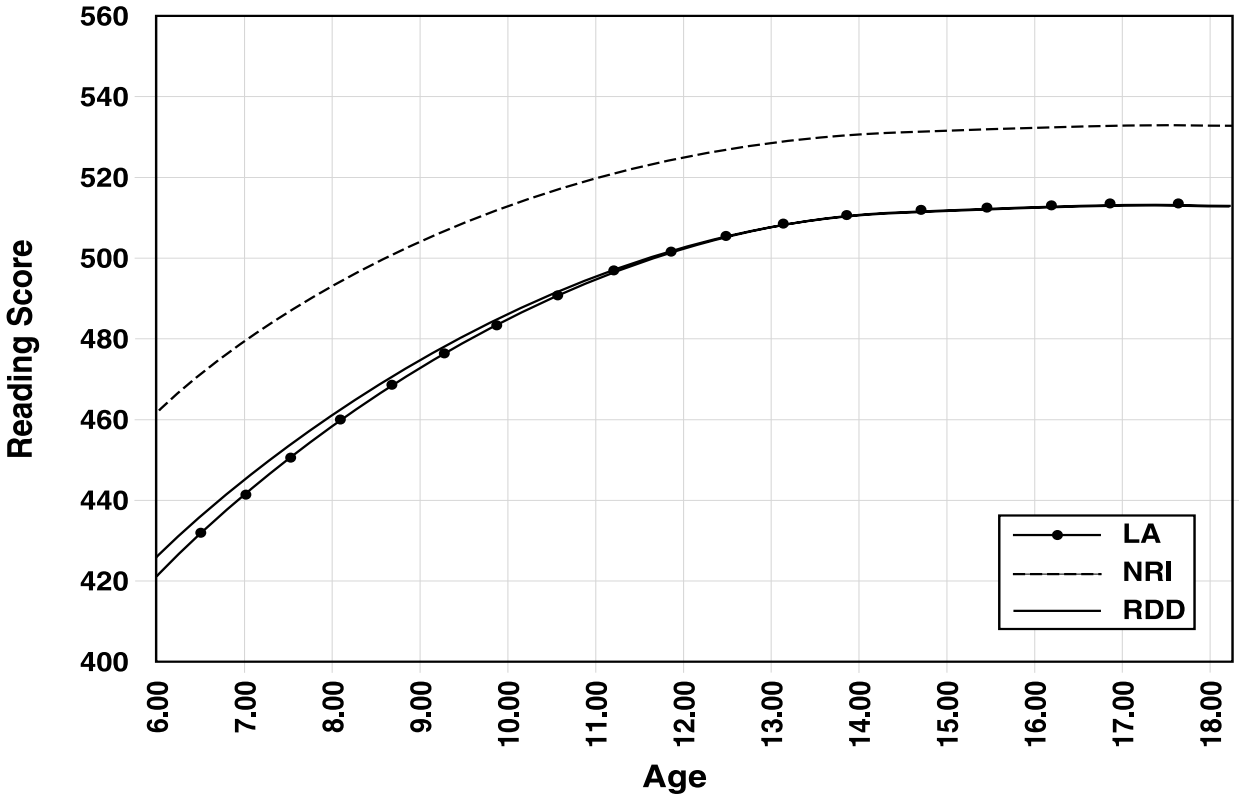


Figure 1. Growth in reading skills by children in the Connecticut Longitudinal Study from the Woodcock-Johnson Psycho-Educational Test Battery from 6-18 years of age (Grades 1-12) by children identified at 8 years of age (Grade 3) as not reading impaired (NRI) or reading disabled according to a discrepancy between IQ and reading achievement (RDD) or low reading achievement with no discrepancy (LA). The figure shows that growth in the two groups with reading disability is similar (the growth curves are indistinguishable); neither catches up to the NRI group; and the differences between the NRI group and the two groups with reading disability are apparent well before Grade 3.

An Evidence-Based Argument for Early Identification, Prevention, and Early Intervention

Good readers understand how print represents the sounds of speech, can apply phonemic and phonics skills in a rapid and fluent manner, and possess sufficient vocabularies and other language abilities to actively connect what they are reading to their background knowledge and experiences. Conversely, children who are most likely to have reading difficulties enter kindergarten lacking sufficient phonological processing skills and fail to develop adequate word reading ability. This bottleneck in word reading skills limits their ability to learn how to read text in a fluent fashion. Their text reading is typically slow and laborious, which impedes their comprehension of what is read. Among these children, the effort exerted in reading is frequently not rewarded by enjoyment and learning. Frustration on the part of the child and a decrease in reading behavior are often observed. Limited reading practice and experience result in weak vocabulary development and difficulties in learning other academic subjects. And the cycle goes on.[33]

Special education professionals and programs should become a source for preventative interventions.

Given that the underlying causes of most early reading difficulties are similar for children regardless of whether they are currently served in special or compensatory education programs, we argue that the most valid and efficient way to deliver this early intervention in reading is through regular education. This approach allows limited funds to be targeted at intervention rather than expensive eligibility determination practices. Initially, however, the specialized instructional approaches that will be necessary for some children are typically not within the purview of general education teachers. Thus, special education professionals and programs should become a source for preventative interventions. Regardless of the approach to classification, we contend that it is critical to provide this instruction as early as possible in a child's school career to avoid the reading failure that will otherwise occur. That is the major message of this chapter.

As mentioned before, children identified as RD after Grade 2 rarely catch up to their peers. Thus, the long-term development of reading skills appears to be set early and is difficult to alter. Figure 1 shows the development of reading skills of children in the Connecticut Longitudinal Study, which followed them from kindergarten through Grade 12.[34]

Three groups are depicted, including children who are not reading impaired (NRI) as well as groups defined in Grade 3 as RD using either IQ-discrepancy (RDD group) or low-achievement (LA group) definitions. Thus, one group of children would qualify for special education as LD under federal guidelines (RDD), while the other group (LA) would not qualify despite the fact that Figure 1 shows the RDD and LA groups are comparably impaired in reading ability. The overall pattern depicts large differences in the development of the NRI and two RD groups. However, the two RD groups are almost indistinguishable and neither catches up to the NRI group despite the fact that schools identified at least half the children as eligible for special education services. Particularly sobering is the finding that over 70 percent of the group identified as RD in Grade 3 was still identified as RD in Grade 12. Regardless of how they are defined, reading disabilities are often chronic, lifelong incapacities that lead to problems in a variety of social and

vocational areas in adolescence and adulthood.

By measuring reading skills longitudinally from kindergarten, the Connecticut Longitudinal Study also shows that children are behind in reading long before Grade 3. Other studies support the view that many children are behind in reading early in their development and that they can be reliably identified well before Grade 2. For example, in a study conducted by Connie Juel and her colleagues at the University of Texas, it was found that word recognition skills at the end of first grade were strongly related to reading proficiency at the end of Grade 4.[35] Indeed, almost 9 of 10 children who were deficient in word recognition skills in first grade were poor readers in fourth grade. Similarly, 8 of 10 children with severe word reading problems at the end of the first grade performed below the average range at the beginning of the third grade. Joseph Torgesen and his associates at Florida State University showed that these patterns could be detected as early as kindergarten and persisted through Grade 5.[36] This research has been the basis for early reading assessments in Texas and Virginia.

The importance of early intervention is clearly apparent from studies of typical special education remediation services for reading and math skill development.

These and other longitudinal studies indicate that early reading difficulties portend later reading difficulties. Further, these studies tell us that children do not typically "catch up" on their own. Unless addressed with well-designed instruction, struggling readers stay that way. Historically, schools have opted to address these persistent reading difficulties through the provision of remedial and special education services typically beginning in second grade and beyond. Yet the majority of children provided such services fail to become skilled readers. We will now examine specific attempts to improve reading skills, first through remedial efforts, then through preventative efforts.

Remediation

The importance of early intervention is clearly apparent from studies of typical special education remediation services for reading and math skill development. Perhaps most revealing is an analysis of a large data set by Eric Hanushek and colleagues. They found that placement in special education was associated with a gain of 0.04 standard deviations in reading and 0.11 in math. Unfortunately, these gains are so small that children are not closing the gap between their academic performance and the performance of their higher achieving classmates. Thus, many of these children remain for lengthy periods of time in special education programs that were ostensibly meant to close the academic gaps.[37]

Remediation models for older children have been ineffective for several reasons, but two stand out. First, the standard instruction provided through remediation is frequently too little, too general, and too unsystematic. Second, even if the instruction were of high quality, it may be too late given that many children are already far behind and less motivated to learn to read following a year or more of reading failure.

Regarding the first reason, Sharon Vaughn and her colleagues studied children with RD who were served for an entire year in public elementary school special education resource rooms.[38]

The researchers found that their instruction was characterized primarily by whole group reading instruction to large groups of children (5-19) who also varied widely in grade level (3-5 grades). Despite this variation, little individualized or differentiated instruction occurred. Although a follow-up study two years later showed that more of the teachers were utilizing materials that supported differentiated instruction, none of these studies found evidence that children made significant gains in reading. Several earlier studies also failed to find evidence supporting significant gains in reading skills through specialized reading instruction programs.[39]

These observations do not represent new findings. Special education classes often reflect what happens in general education classes; over the past two decades, there has been a gradual movement away from small-group, differentiated instruction and towards the inclusion of special education students in general education classes, as well as a gradual trend towards more undifferentiated whole group instruction, even in pull-out classrooms. Moreover, other studies show that placement in special education commonly results in *less* reading instruction for students with RD because it takes the place of language arts instruction in the general education classroom. In addition, despite the fact that most students with LD require direct and intensive instruction in reading, even special education teachers spend little time directly teaching reading skills, and remedial students spend very little of their time reading in these "specialized" programs.[40] In short, the remediation services for elementary grade children in today's special education classrooms are not particularly effective.

These and similar findings which demonstrate a lack of efficacy for conventional "pull-out" special education instructional-remediation models served as a major impetus for the "inclusion movement" in special and general education that currently guides instructional practices in many states. Unfortunately, several studies have documented that inclusion practices are especially ineffective for older poor readers. For example, in one study, 80 percent of the poorest readers made no measurable gain over the school year.[41] What is clear is that neither traditional "pull-out" programs nor inclusion practices have been effective in helping poor readers in Grades 2 and beyond develop the critical literacy skills they need.

Several studies have documented that inclusion practices are especially ineffective for older poor readers.

It is possible that the lack of progress in reading made by these relatively "older" students can be attributed to insufficient teacher preparation, large class sizes, and the lack of specialized reading instruction. Yet even where teachers received professional development and support, the amount of progress made by the end of the year did not close the reading gap.[42] Because the purpose of reading remediation is to close the achievement gap, these findings, like those obtained by Hanushek and associates, were not very positive.

Even with as few as eight children in a group, teachers find it difficult to impart the necessary individualized instruction with appropriate intensity. Many programs have been developed that provide individualized tutoring. Unfortunately, such programs have been infrequently evaluated, particularly for older poor readers. They have also been difficult to introduce into public schools given their cost, the need for specialized professional development, and the sheer number of children who need to be served. However, there is little evidence that 1:1 (one teacher to one student) instruction is

Figure 2. Growth in Total Reading Skill Before, During, and Following Intensive Intervention

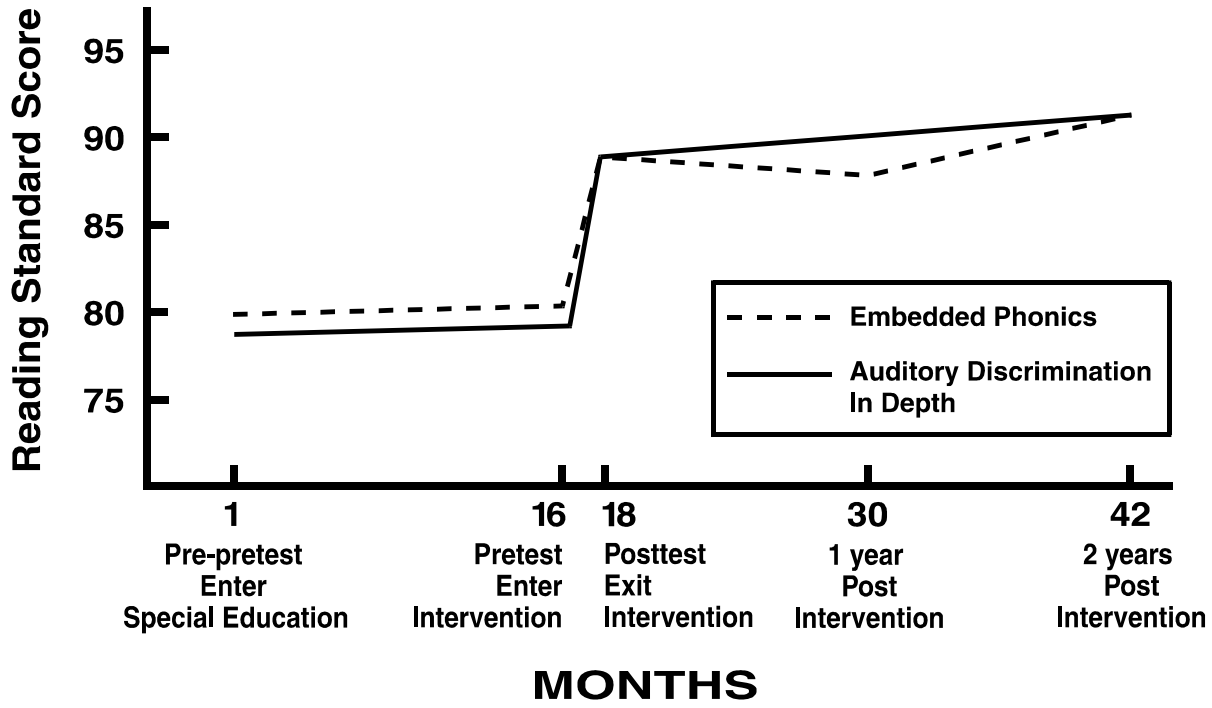


Figure 2. Changes in broad reading skills on the Woodcock-Johnson Psycho-Educational Test Battery by disabled readers in Grades 3-5 during 16 months of placement in special education prior to intensive reading remediation (pre-pretest to pretest), a 2 month intervention with random assignment to the Auditory Discrimination in Depth (ADD) or Embedded Phonics (EP) programs (pretest to posttest), and one- and two-year follow-up assessments after completion of the intervention. The figure shows little change in reading skills prior to the two-month intervention remediation, significant improvement from (on average) below the 10th percentile (standard score of 80) to the average range (25th percentile; standard score of 90). There were no differences in the efficacy of the two programs, and children maintained the gains after the two month intervention at one and two year follow-ups.

necessary. Groupings of 3:1 up to 5:1 have been found effective, and sometimes more effective than a 1:1 teacher/student ratio if the children are similar in their reading levels.[43]

With regard to older poor readers, unfortunately, even the best studies using highly intensive remediation approaches have improved only a subset of critical reading skills. For example, Torgesen and his group conducted a series of well-designed reading remediation trials with severely disabled readers in grades 3-5.[44] The students were randomly assigned to one of two remediation approaches. One intervention was the Lindamood Auditory Discrimination in Depth (ADD) program; the other was labeled "Embedded Phonics" (EP). Both programs provided explicit instruction in phonics but varied in the amount of phonics instruction and the amount of practice in reading and writing connected text. Students received 67.5 hours of individualized

instruction in one of these two programs over an eight-week period.

Figure 2 describes the growth in broad reading ability (a combination of word reading accuracy and reading comprehension) by the children during their 16 months of special education prior to the research intervention (pre-pretest to pretest, with pre-pretest based on the school's assessment). It also shows the growth they made during the eight weeks of intervention (pretest to posttest) and in the two years following the interventions. The children showed little change in the 16 months preceding the interventions, major improvements from pretest to posttest, and maintenance of the gains for two years after the intervention.

Although these results show that appropriate and intensive interventions can help older children substantially improve their reading accuracy and comprehension, almost all the children in the study remained very slow readers. Their scores on standardized measures of reading fluency remained below the 5th percentile two years after the intervention. In attempting to account for these mixed findings, Torgesen's group theorized that a major factor in the development of fluency is the number of words to which a child is exposed through frequent reading practice. Children with word recognition difficulties avoid reading, so these children build up enormous deficits during the time they remain poor readers in elementary school. Thus, it is extremely difficult for them to "catch up" to their peers in total amount of reading practice time, particularly because their normally reading peers are continuing their high rates of reading practice.

Although time and expense should not dictate how we address the educational needs of children, the reality is that few school systems presently have access to the necessary resources.

Although the children remained slow readers, Torgesen and colleagues' study is noteworthy because the gains in reading accuracy and comprehension were maintained after the intervention was terminated. The study is also significant because it shows that more intensive instruction than is typically provided in special education classrooms can have a very significant effect on some reading skills of children with severe reading disabilities in a relatively short period of time. Keep in mind that during the 16 months prior to the intervention, the children made almost no progress toward closing the gap in word reading and comprehension skills. After the intervention, however, many of the children maintained some reading skills within the average range. Moreover, despite the reading fluency weaknesses, 40 percent were returned from special education to regular education classes, which greatly exceeds the 5 percent figure commonly cited for leaving special education. These remediated students returned from a program that lasted 8 weeks but was very intense, and they occurred under two different types of intervention.

It is likely that understanding of how to improve all reading skills among older disabled readers will increase in the next few years. But we must expect that the reading programs and strategies found to be effective through this research will continue to require low teacher-student ratios, highly trained personnel, and a level of instructional intensity and duration that is time-consuming and expensive. Although time and expense should not dictate how we address the educational needs of children, the reality is that few school systems presently have access to the

necessary resources. In reading, this is partly because of the sheer number of older children with RD who require services. The number of students identified as LD and provided special education services increases with age for two major reasons. First, as pointed out previously, many children identified at approximately nine to ten years of age are not effectively remediated and therefore continue to receive services. Second, a large number of children are identified as LD during middle and high school primarily because their reading difficulties preclude learning in content areas.

There is substantial evidence that early identification and intervention in kindergarten and Grade 1 may substantially reduce the number of children that might otherwise be eligible for special services.

Prevention

Because most reading remediation efforts have not been effective, a number of recent studies have looked at prevention and early intervention approaches that have the potential to reduce the number of children who eventually qualify for special education or compensatory education programs. In reading, prevention research efforts have been especially promising. Both the consensus report of the National Research Panel (NRP)[45] and the evidence-based report of the National Reading Council (NRC)[46] concluded that reading problems for many children could be prevented.

The NRC report suggested that in kindergarten, for example, children could be identified as "at-risk" for word reading difficulties on the basis of their performance on tasks that assess phonemic awareness and naming abilities. The types of measures that are most predictive of later reading ability involve the child's knowledge of letter sounds, the ability to blend sounds into words (done orally), and, at the end of kindergarten, the ability to name letters rapidly. By first grade, the child's ability to read appropriately leveled words is the best predictor of later reading success.

The beneficial effects of early identification and intervention are apparent in many studies. The NRP identified a large body of research showing that explicit teaching of the relation of print and sounds through phonological awareness training and phonics was especially effective in kindergarten and Grade 1, with the instructional effects diminishing in subsequent grades when word recognition skills had been developed to a level that adequately supported reading of connected text.

There is substantial evidence that early identification and intervention in kindergarten and Grade 1 may substantially reduce the number of children that might otherwise be eligible for special services. Torgesen recently summarized five such studies, all of which resulted in a reduction in the number of potentially eligible children.[47] In all these studies, children were identified as at-risk for RD in kindergarten or Grade 1 based on assessment results that identified the children in the bottom 12-18 percent (depending on the study) of the school population in either reading skills (Grade 1) or phonological processing (kindergarten). After intervention, the reading performance of the primary intervention groups in each of the five studies was well within the average range. But not all programs work with all children. Across

the five studies, 8-30 percent of the children completed the intervention with reading scores below the average range. On the other hand, these children fell in the bottom 12-18 percent of all kindergarten/Grade 1 students in reading skills, and the response rate for the interventions suggests that if they were available to all children at-risk for reading difficulties, less than 6 percent of the population would be eligible for services later in school. Simply stated, when an intervention is used with the bottom 18 percent of the student population and works with 70 percent of them, the number of at-risk children requiring services is reduced from 18 percent to 5.4 percent.[48] Across the five studies, the expected incidence of RD was reduced from 12-18 percent to 1.4-5.4 percent.

The five studies varied in how children were identified as "at-risk," the types of early interventions employed, and the student-teacher ratios. All studies followed children for 2-5 years and all showed that the gains were maintained. Moreover, in contrast to the remedial studies described above, improvement in both accuracy and fluency of word recognition skills was apparent, with gains also present in comprehension skills.[49]

The goal of remedial reading instruction should be to improve reading skills as quickly as possible so the student can "read to learn" in critical content areas.

None of the intervention programs were equally effective for all of the children studied. There may be individual characteristics of children that predispose them to more or less success with a particular program. Research examining this possibility is underway, but it's already clear that we need to move away from a "one-size-fits-all" mentality and apply continuous assessment approaches that evaluate how well an instructional program is working with particular youngsters. The growth of reading skills can be constantly measured over time in the classroom, and these "curriculum-based" approaches can identify children who are not responding optimally to a particular instructional strategy. This information can then give the teacher an objective basis for modifying instruction to address a particular student's needs.[50]

The prevention and early intervention research has its critics. Some argue that early identification is fraught with errors leading to misidentification and may incorrectly label a student as at-risk for academic failure.[51] We respond by suggesting that a label is not necessary for implementation of prevention programs and the costs of delaying intervention are too great to wait. Indeed, we hope that, at some point, all kindergarten and elementary grade teachers will have had sufficient training to provide instruction that incorporates prevention into the normal course of their teaching. Even with this enhanced capacity, however, some children will need more instructional intensity than they can obtain in a typical classroom.

Other critics identify studies that show greater gains in word recognition than comprehension, and suggest that many early intervention studies show diminished gains in the later grades.[52] We respond by pointing out that the so-called "fourth-grade" slump does not mean that children begin to decline in the reading abilities gained; rather, they simply begin to show a reduction in the rate of growth. The key is to continue reading instruction throughout elementary school with a focus on continually integrating word-reading skills, fluency instruction, and reading

comprehension skills in the later grades. Learning to read words is necessary but not the only condition for literacy proficiency.

Not all children will benefit from early intervention. Nevertheless, as stated in the above discussion of prevention studies, children whose word recognition skills were not brought into the average range did improve to some degree in the five studies. These children may require different interventions over time and/or more intensive programs to foster compensatory learning strategies while continuing to work on basic academic skills deficits. The goal of remedial reading instruction should be to improve reading skills as quickly as possible so the student can "read to learn" in critical content areas. To accomplish this, students, particularly at older age ranges, require highly intensive and systematic instruction provided in settings characterized by low teacher-student ratios. This can only be done when the potential number of children with reading difficulties has been reduced to manageable levels through early intervention.

Even the best evidence-based recommendations will not be utilized and sustained in practice unless careful thought is given to identifying the conditions that will increase the probability of their successful implementation.

How Policies and Practices Must Change

We have endeavored to illustrate the following: (1) the origins of the concept of LD; (2) old and sometimes incorrect assumptions about LD that have been maintained in public policy; (3) the specific scientific and educational problems with current definitions of LD; (4) the limited effectiveness of current reading remediation approaches; and (5) the potential value of early identification and intervention approaches in reducing reading failure. We conclude that significant improvements in education policies and practices related to the definition of LD, changes in teacher preparation, and development and implementation of early intervention and remediation programs must occur if the educational needs of children are to be met. However, we realize that even the best evidence-based recommendations will not be utilized and sustained in practice unless careful thought is given to identifying the conditions that will increase the probability of their successful implementation.

These conditions include our ability to (1) ensure that all recommendations have been sufficiently tested to acknowledge clearly their strengths and weaknesses and evaluate their specific impact on the children and adults to be served; (2) anticipate the effects of changes in policies and practices on federal, state, and school communities and address them effectively; (3) take into account barriers to change in public school policy and practice; and (4) articulate specific areas where capacity must be developed to ensure successful implementation. We recognize that our recommendations will require time and resources to determine whether these essential conditions can be met. Hasty implementation of these recommendations without full knowledge of the challenges that confront such significant change could put students in jeopardy. *Thus, we recommend that the relevant government agencies undertake a consensus development initiative through which the federal definition of LD and attendant eligibility and intervention issues raised in this chapter are evaluated in an attempt to align policy with*

research.

With this as background, we now summarize our major recommendations for improvements in the definition of LD, teacher preparation, and the development and implementation of early intervention and remediation programs. We conclude by articulating what we consider to be the significant factors that must be addressed if productive implementation of these recommendations is to occur.

Recommendations for Improvement in the Definition(s) of LD

First, replace the current generic exclusionary definition of LD with evidence-based definitions that specify precise characteristics necessary to identify children with LD in reading, mathematics, written expression, and oral language. This type of effort has already been accomplished in the area of reading disabilities, giving rise to greater precision in describing children under study and in providing appropriate instructional services. Until such definitions are developed for all types of LD, reliable assessment and appropriate instruction of children with LD will continue to be compromised.

There is a pressing need for early, intensive, empirically based interventions to be made easily available to children through general education.

Second, jettison the IQ-achievement criterion as a primary marker for LD. Assessment and identification strategies that replace the use of IQ-achievement test comparisons are clearly possible. In most cases, student underachievement can be predicted on the basis of performance on tasks assessing skills directly related to the academic domain in question. Further, underachievement can be documented by direct comparisons of students' age and grade with their academic functioning in oral language, reading, mathematics, and written language.

Third, stop excluding children because of inadequate instruction, cultural and social factors, and emotional disturbance. These exclusions may be policy-driven, designed to avoid commingling of funds for compensatory and special education, but we should not allow our conceptualizations of LD to be driven by policy issues. In the case of inadequate instruction and cultural/social factors, we have argued that it is just these factors that may lead to inadequacies in neural and cognitive development that place children at significant risk for LD. Thus, decisions to maintain distinctions between compensatory and special education services should not drive our conception of LD. Instruction is the key for all children who are not achieving according to expectations.

Fourth, include consideration of a student's response to well-designed and well-implemented early intervention as well as remediation programs as part of the identification of LD. Recall Senf's sponge metaphor. There is a pressing need for early, intensive, empirically based interventions to be made easily available to children through general education. There are too many "spills" in the current system. The complex identification criteria and expensive due process procedures of special education should be reserved for children who have not responded to the powerful shorter-term interventions that are presently available. No doubt, children who do not benefit from these interventions will require even more intensive

remediation programs as well as educational accommodations as they proceed through school.

These four recommendations are offered with two caveats. First, the assessment practices and criteria that we have proposed should not lead to the identification of LD without input from teachers, parents, and others responsible for the child's education. Typically a multidisciplinary school-support team undertakes this function. Such teams should have sway over decisions based solely on test scores, as provided in the IDEA.

Second, our recommendations can be expected to change who is identified as LD. The exclusionary and IQ-achievement elements of the LD definition have served as artificial "caps" on LD prevalence, while the lack of robust interventions for academically unsuccessful students in general and compensatory education has inflated LD identification rates. A key to more effective responses to learning difficulties in general education and lowered LD prevalence will be policies that do not simply change the criteria for identifying LD, but that truly improve the capacity of teachers and schools to implement sound early interventions with the necessary fidelity. Years of disappointing outcomes in special and compensatory education have taught us that mandated instructional/intervention programs (usually watered-down to allow rapid dissemination and a quick fix), ultimately cost more than a reasoned, systematic approach that uses science as a base. Such an approach assures that the policy and implementation issues inherent in broadening from practice to large scale are anticipated and addressed.[53]

Teachers must be provided the critical academic content, pedagogical principles, and knowledge of learner characteristics that they need in order to impart systematic and informed instruction to their students.

Recommendations for Improving Teacher Education

We have noted problems with teacher education as well as the need to incorporate the notion of adequate instruction into definitions of LD. The often-heard statement that many children identified as LD are actually "teaching-disabled" is unfortunately accurate in many cases. Our research has taught us that almost all children can learn to read if taught by appropriate methods, but clearly many students are not receiving appropriate instruction for their reading needs. Is this the teacher's fault? We don't think so. In our experience, people become teachers in order to help make significant positive changes in student's lives and teaching children to read is certainly one of those goals. Teachers, however, like the rest of us, frequently teach what they have been taught. Much evidence shows that teachers are not trained to address individual learning differences in general and specifically are not prepared to teach reading to students who arrive in their classrooms from highly diverse backgrounds and a range of initial abilities. Nor are teachers trained to study and apply research. Once in the classroom, no matter how much teachers want to "keep up" with the most recent research, they are not encouraged to do so.[54]

We doubt that the colleges of education will change their current preparation practices in the near future. What is clear is that teachers must be provided the critical academic content, pedagogical principles, and knowledge of learner characteristics that they need in order to

impart systematic and informed instruction to their students. Some states (such as Texas) and communities (for example, the Houston Independent School District) have considered alternatives to traditional teacher preparation to ensure that teachers can close the gap between research and practice. These initiatives should be carefully evaluated to determine whether such large-scale efforts are effective.

Recommendations for the Development of Prevention and Early Intervention Programs

The technology for implementing early identification and intervention programs is undergoing rapid development. Many states, notably Texas and Virginia, have developed reading assessments for K-2 children that are teacher-administered. Although the purpose of these instruments is to guide instruction, they also serve to signal further evaluation for LD by identifying at-risk children. Through the Reading Excellence Act, some states are developing intensive programs for children who are at-risk for reading difficulties because they are socially disadvantaged. These programs are required to use scientifically based research and to focus on accelerated reading instruction in kindergarten and the early grades. Such strategies may prevent reading failure in many children. The key is to enhance classroom instruction accompanied by targeted intervention programs for children who require more help.

An important lesson can be drawn from compensatory education, where entry criteria are relatively simple and much more funding is targeted for intervention programs.

A major problem with such efforts is that special educators who typically provide instruction to children with LD have not been integrated into the early identification and prevention initiatives and have not had a role in efforts to design and implement early intervention programs. It is important that both regular and special education embrace these efforts and view prevention as part of their mission. The IDEA today allows states to identify 6- to 9-year-old children as eligible for special education services based on a designation of "developmental delay," which means the child is not making progress. Although developmental delay is a fairly meaningless term, especially given the evidence that reading problems become persistent deficits early in schooling, the idea that special education funds can be used for early identification and prevention is critical. Unfortunately, the most recent report to Congress (for 1997-1998) on implementation of the 1997 revision of the IDEA—which permitted use of "developmental delay"—indicated that only eight states actually utilized this eligibility category. Children served under "developmental delay" represented only 1.32 percent of children with disabilities in the 6- to 9-year-old age group.[55]

Although special educators may not be directly involved in the provision of classroom instruction for at-risk children, they should have a clear role in activities related to prevention. This includes early identification and the implementation of specialized interventions within the classroom and elsewhere. Such specialized services and programs should not be oriented toward a determination of eligibility as is presently the case. An important lesson can be drawn from compensatory education, where entry criteria are relatively simple and much more of the funding is targeted for intervention programs rather than administrative issues relevant to

eligibility determination.

What is a Disability?

The emphasis on prevention begs the question of what constitutes the disability in LD. If the role of inadequate instruction is taken seriously, and more aggressive attempts are made to teach all children to read, the meaning of disability could change in the future. In this scenario, the actual diagnosis of LD could be reserved for children whose reading or other academic problems are severe and intractable (that is, for children who do not adequately respond to a variety of intervention approaches). With documented lack of adequate response, eligibility should be more streamlined and less adversarial than is presently the case with LD.[56]

There are few areas where the relationship of science and policy are more loosely linked than LD.

In particular, we do not know if there are characteristics of the environment, the brain, or heredity that make it difficult to teach all children to learn to read, write, and/or develop mathematics competencies. Yet a child who has difficulty learning to read early and whose reading skills never develop to a level commensurate with stronger reading peers will most likely show improved reading levels after aggressive attempts to provide sound early intervention. Such a child may also need extensive modifications of his or her educational environment, more extensive compensatory techniques, and other changes in curriculum such as those made for youngsters with more obvious disabilities.

This is by no means an attempt to "write off" children who do not respond to aggressive instruction, but it is recognition of the role of instruction in the definition of LD. Thus, it may be reasonable to reserve the term "learning disabled" for individuals who clearly do not respond to intensive intervention and who may need more significant modifications of their educational environment in order to maximize their learning experiences in school. It would be important to identify these children and look more closely at both neurobiological and environmental factors that characterize them. With the opportunity to conduct research on children who clearly do not respond to even the best of current interventions, we may be able to understand the causes of this intractability and develop interventions that may further reduce the prevalence of LD in the future. Regardless, such efforts should be tied into preventative approaches through an attempt to implement what is essentially a public health model and reduce the overall prevalence of LD. Under no circumstances should inadequate instruction be used as an excuse for denying access to special education services. Poor instruction *causes* LD and should not be exclusionary.

Science and Policy

There are few areas where the relationship of science and policy are more loosely linked than LD. This is unfortunate. In too many instances, policy-related issues have driven the scientific agenda relevant to LD. This situation should be reversed; research should drive policy on LD. But the production of clear, convergent findings is only the first step. Effecting meaningful change in the lives of children and teachers requires that we not only have sound scientific findings, but also that we understand how to formulate policies based on these findings to produce changes we desire at the individual child level. It is unlikely the formulators of the EAHCA envisioned that the majority of those served by their legislation would be children in a

relatively new disability category. Similarly, although changes needed in the LD identification criteria and intervention practices seem obvious based on the research presented here, we must expect unintended consequences to follow from any changes. Considering that enhancing local capacity is key to any change efforts, the fundamental changes we desire in educational practice will require time and resources to implement.

It is time to more tightly link policy, research, and practice in LD. Programs that are implemented on the basis of policy should be continuously evaluated for their efficacy. Similarly, instructional interventions for children with LD should carry with them the expectation that they will be based on research and evaluated in a serious way. Decisionmaking in education, whether it involves policy or practice, should be guided by research. Society should have the same expectations for education policy and practice that it has for medicine. We do not believe that the criteria used to evaluate evidence are meaningfully different, nor that decisions on how much research is necessary to implement a particular policy or practice are particularly different in education, medicine, or related areas.

Such a radical restructuring of education policy and practice can only be successfully accomplished if we acknowledge the complexity of the task before us. We have a model of successful inquiry into the nature of reading disorders that can be applied to other learning disorders. We now need to use what we know about LD and about education change to construct and evaluate models for successful change in educational policy and practice for children with learning difficulties. It is time to apply the same care and precision used in conducting the original research to the task of effecting serious policy change based on that research. The real tragedy is that conceptualizations of LD have not changed over 30 years despite the completion of significant research in the past 15 years. What we know from research now needs to be implemented. Children deserve no less.

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[2] See Cecil Mercer, et al., "Learning Disabilities Definitions and Criteria Used by State Education Departments," *Learning Disabilities Quarterly* 19 (1996): 217-232; "Definition and Criteria for Defining Students as Learning Disabled," 42 Fed. Reg. 65,083 (1977); and "Assistance to States for the Education of Children with Disabilities Program and Preschool Grants for Children with Disabilities Final Rule," 34 C.R.F. 300 and 301 (1992).

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[7] S. Kirk, *Educating Exceptional Children* (Boston, MA: Houghton Mifflin, 1962), 263.

[8] See S. Kirk, "Behavioral Diagnosis and Remediation of Learning Disabilities," in *Proceedings of the Conference on Exploration into the Problems of the Perceptually Handicapped Child* (Evanston, IL: Fund for the Perceptually Handicapped Child, Inc., 1963), 1-7.

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[10] Education of the Handicapped Act, Title VI, Pub. L. No. 91-230 (1969-1970).

[11] Individuals with Disabilities Education Act Amendments of 1991, Pub. L. No. 102-119, 20 U.S.C. § 1401 et seq.

[12] See Office of Special Education Programs, *Implementation of IDEA*.

[13] See Individuals with Disabilities Education Act, Pub. L. No. 102-119. Other definitions and their historical origins are discussed in G.R. Lyon, "Learning Disabilities," *The Future of Children* 6 (1996): 54-76.

[14] See G.R. Lyon, "Toward a Definition of Dyslexia," *Annals of Dyslexia* 45 (1995): 3-30; and K. Stanovich, "The Construct Validity of Discrepancy Definitions of Reading Disability," in *Better Understanding Learning Disabilities: New Views from Research and Their Implications for Education and Public Policies*, eds. G.R. Lyon, et al. (Baltimore, MD: Paul H. Brookes, 1993), 273-295.

[15] See K. Kavale and S. Forness, *The Science of Learning Disabilities* (San Diego, CA: College Hill Press, 1985).

[16] Literature on post-mortem and structural imaging studies was reviewed in P. Filipek, "Structural Variations in Measures in the Developmental Disorders," in *Developmental Neuroimaging: Mapping the Development of Brain and Behavior*, eds. R. Thatcher, G. Lyon, J. Rumsey, and N. Krasnegor (San Diego, CA: Academic Press, 1996), 169-186. Functional imaging studies involve several modalities, such as positron emission tomography, functional magnetic resonance imaging, and magnetoencephalography. See S.E. Shaywitz, K.R. Pugh, A.R. Jenner, R.K. Fulbright, J.M. Fletcher, J.C. Gore, and B.A. Shaywitz, "The Neurobiology of Reading and Reading Disability (Dyslexia)," in *Handbook of Reading Research*, *Volume IIi,*.eds. M.L. Kamil, P.B. Mosenthal, P.D. Pearson, and R. Barr (Mahwah, NJ: Lawrence Erlbaum, 2000), 229-249.

[17] See Richard K. Olson, "Genes, Environment, and Reading Disabilities," in *Perspectives on Learning Disabilities,* eds. R.J. Sternberg and L. Spear-Swerling (Oxford: Westview Press, 1999), 3-22; and B. Pennington, "Dyslexia as a Neurodevelopmental Disorder," in *Neurodevelopmental Disorders*, ed. H. Tager-Flusberg (Cambridge, MA: MIT Press, 1999), 307-330.

[18] Detailed reviews of the issues with discrepancy models can be found in J.M. Fletcher, D.J. Francis, S.E. Shaywitz, G.R. Lyon, B.R. Foorman, K.K. Stuebing, and B.A. Shaywitz, "Intelligent Testing and the Discrepancy Model for Children with Learning Disabilities," *Learning Disabilities Research & Practice* 13 (1998): 186-203; and L.S. Siegel, "Learning Disabilities: The Roads We Have Traveled and the Path to the Future," in *Perspectives on Learning Disabilities,* eds. R.J. Sternberg and L. Spear-Swerling (Oxford: Westview Press, 1999), 159-175.

[19] These recommendations can be found in Assistance to States for Education for Handicapped Children: Procedures for Evaluating Specific Learning Disabilities, 42 Fed. Reg. G1082-G1085 (1977).

[20] The 20th century reflects a period of extensive discussion of how to define different groups of low achievers that culminated in the concept of LD. This history is discussed by J.L. Doris, "Defining Learning Disabilities: A History of the Search for Consensus," in *Better Understanding Learning Disabilities*, eds. G.R. Lyon, D.B. Gray, J.F. Kavanaugh, and N.A. Krasnegor (Baltimore, MD: Paul H. Brookes, 1993), 97-116; see also M. Rutter, "Syndromes Attributed to Minimal Brain Dysfunction in Childhood," *American Journal of Psychiatry* 139 (1982): 21-33.

[21] See R.L. Thorndike, *The Concepts of Over and Under Achievement* (New York: Columbia University Bureau of Publications, 1963).

[22] The statistical problems with the use of IQ-discrepancy scores have been widely documented. See C.R. Reynolds, "Critical Measurement Issues in Learning Disabilities," *Journal of Special Education* 18 (1974): 451-476.

[23] Longitudinal research has shown that IQ-discrepancy scores are not reliable in Grade 1, but are reliable in Grade 3 (and most likely in Grade 2, which was not included in the following study). See S.E. Shaywitz, M.D. Escobar, B.A. Shaywitz, J.M. Fletcher, and R. Makuch, "Distribution and Temporal Stability of Dyslexia in an Epidemiological Sample of 414 Children Followed Longitudinally," *New England Journal of Medicine* 326 (1992): 145-150.

[24] See S.E. Shaywitz, J.M. Fletcher, J.M. Holahan, A.E. Schneider, K.E. Marchione, K.K. Stuebing, D.J. Francis, and B.A. Shaywitz, "Persistence of Dyslexia: The Connecticut Longitudinal Study at Adolescence," *Pediatrics* 104

(1999): 1351-1359.

[25] See J.K. Torgesen, R.K. Wagner, C.A. Rashotte, E. Rose, P. Lindamood, J. Conway, and C. Garvan, "Preventing Reading Failure in Young Children with Phonological Processing Disabilities: Group and Individual Responses to Instruction," *Journal of Educational Psychology* 91 (1999): 579-594; and F.R. Vellutino, D.M. Scanlon, and G.R. Lyon, "Differentiating Between Difficult-to-Remediate and Readily Remediated Poor Readers: More Evidence Against the IQ-Achievement Discrepancy Definition for Reading Disability," *Journal of Learning Disabilities* 33 (2000): 223-238.

[26] See A.D. Ross, *Psychological Aspects of Learning Disabilities and Reading Disorders* (New York: McGraw-Hill, 1976).

[27] See M. Rutter, "Prevalence and Types of Dyslexia," in *Dyslexia: An Appraisal of Current Knowledge*, eds. A.L. Benton and D. Pearl (New York: Oxford University Press, 1978), 3-28.

[28] See P.B. Gough and M.L. Hillinger, "Learning to Read: An Unnatural Act," *Bulletin of the Orton Society* 30 (1980): 179-196; and A.M. Liberman, "How Theories of Speech Effect Research in Reading and Writing," in *Foundations of Reading Acquisition and Dyslexia: Implications for Early Intervention*, ed. B. Blachman (Mahwah, NJ: Lawrence, 1997).

[29] For an excellent discussion of the relationship between environmental, cultural, and economic factors; the presence of teratogens; neural development; and learning, see D.P. Hallahan, J.M. Kauffman, and J.W. Lloyd, *Introduction to Learning Disabilities* (Boston, MA: Allyn and Bacon, 1996).

[30] See G. Senf, "LD Research in Sociological and Scientific Perspective," in *Psychological and Educational Perspectives on Learning Disabilities*, eds. J. Torgesen and B. Wong (Orlando, FL: Academic Press, 1986), 27-53.

[31] See American Federation of Teachers, *Teaching Reading* Is *Rocket Science: What Expert Teachers of Reading Should Know and Be Able to Do* (Washington, DC: American Federation of Teachers, 1999).

[32] See G.R. Lyon, M. Vaasen, and F. Toomey, "Teachers' Perceptions of their Undergraduate and Graduate Training," *Teacher Education and Special Education* 12 (1989): 164-169; and L.C. Moats, "The Missing Foundation in Teacher Preparation," *American Educator* 19 (1995): 43-51.

[33] See J.M. Fletcher, and G.R. Lyon, "Reading: A Research-Based Approach," in *What's Gone Wrong in America's Classrooms*, ed. W. M. Evers (Stanford, CA: Hoover Institution Press, 1998), 49-90; and S. Shaywitz, "Dyslexia," *Scientific American* 275 (1996): 98-104.

[34] See S.E. Shaywitz, J.M. Fletcher, J.M. Holahan, A.E. Schneider, K.E. Marchione, K.K. Stuebing, D.J. Francis, and B.A. Shaywitz, "Persistence of Dyslexia: The Connecticut Longitudinal Study at Adolescence," *Pediatrics* 104 (1999): 1351-1359.

[35] See C. Juel, "Learning to Read and Write: A Longitudinal Study of 54 Children from First through Fourth Grades," *Journal of Educational Psychology* 80 (1988): 437-447.

[36] See J.K. Torgesen, "The Prevention and Remediation of Reading Disabilities: Evaluating What We Know from Research," *Journal of Academic Language Therapy* 1 (1997): 11-47.

[37] See E.A. Hanushek, J.F. Kain, and S.G. Riukin, "Does Special Education Raise Academic Achievement for Students with Disabilities?" (National Bureau of Economic Research working paper no. 6469, 1998).

[38] See S.W. Moody, S.R. Vaughn, M.T. Hughes, and M. Fischer, "Reading Instruction in the Resource Room: Set Up for Failure," *Exceptional Children* 16 (2000): 305-316; J.S. Schumm, S.W. Moody, and S.R. Vaughn, "Grouping for Reading Instruction: Does One Size Fit All?" *Journal of Learning Disabilities* 5 (2000): 477-488; and S.R. Vaughn, S.W. Moody, and J.S. Shuman, "Broken Promises: Reading Instruction in the Resource Room," *Exceptional Children* 64 (1998): 211-225.

[39] See R.L. Allington and A. McGill-Franzen, "School Response to Reading Failure: Instruction for Chapter One and Special Education Students Grades Two, Four, and Eight," *Elementary School Journal* 89 (1989): 529-542; M.C. Haynes and J.R. Jenkins, "Reading Instruction in Special Education Resource Rooms," *American Educational Research Journal* 23 (1986): 161-190; and A. McGill-Franzen, "Compensatory and Special Education: Is There Accountability for Learning and Belief in Children's Potential?" in *Getting Reading Right from the Start: Effective Early Literacy Interventions,* eds. E.H. Hiebert and B.M. Taylor (Boston, MA: Allyn and Bacon, 1994), 13-35.

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Without Learning Disabilities in Inclusive Classrooms," *Learning Disabilities Research & Practice* 13 (1997): 153-161. These results are consistent with other studies. See, for example, N. Zigmond and J.M. Baker, "Concluding Comments: Current and Future Practices in Inclusive Schooling," *The Journal of Special Education* 29 (1995): 245-250.

[42] See B. R. Foorman, D.J. Francis, T. Beeler, D. Winikates, and J.M. Fletcher, "Early Interventions for Children with Reading Problems: Study Designs and Preliminary Findings," *Learning Disabilities* 8 (1997): 63-71.

[43] See B.E. Elbaum, S. Vaughn, M.T. Hughes, and S.W. Moody, "How Effective are One-to-One Tutoring Programs in Reading for Elementary Students At-Risk for Reading Failure? A Meta-Analysis," *Journal of Educational Psychology* (in press).

[44] See J.K. Torgesen, A.W. Alexander, R.K. Wagner, C.A. Rashotte, K. Voeller, T. Conway, and E. Rose, "Intensive Remedial Instruction for Children with Severe Reading Disabilities: Immediate and Long-Term Outcomes from Two Instructional Approaches," *Journal of Learning Disabilities* 34 (2001): 33-58.

[45] See National Institute of Child Health and Human Development, *The Report of the National Reading Panel: An Evidence-Based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction* (Bethesda, MD: National Institute of Child Health and Human Development, 2000).

[46] C. Snow, et al., *Preventing Reading Difficulties in Young Children* (Washington, DC: National Academy Press, 1999).

[47] See J.K. Torgesen, "Individual Responses in Response to Early Interventions in Reading: The Lingering Problem of Treatment Resisters," *Learning Disabilities Research & Practice* 15 (2000): 55-64. The five studies are as follows: R.H. Felton, "Effects of Instruction on the Decoding Skills of Children with Phonological-Processing Problems," *Journal of Learning Disabilities* 26 (1993): 583-589; B.R. Foorman, D.J. Francis, J.M. Fletcher, C. Schatschneider, and P. Mehta, "The Role of Instruction in Learning to Read: Preventing Reading Failure in At-Risk-Children," *Journal of Educational Psychology* 90 (1998): 37-55; J.K. Torgesen, R.K. Wagner, C.A. Rashotte, and J. Herron, "The Effectiveness of Teacher Supported Computer Assisted Instruction in Preventing Reading Problems in Young Children: A Comparison of Two Methods" (unpublished manuscript, Florida State University, Tallahassee, FL); and J.K. Torgesen, R.K. Wagner, C.A. Rashotte, E. Rose, P. Lindamood, and C. Galvan, "Preventing Reading Failure in Young Children with Phonological Processing Disabilities: Group and Individual Responses to Instruction," *Journal of Educational Psychology* 91 (1999): 1-15; and F.R. Vellutino, D.M. Scanlon, E. Sipay, S. Small, A. Pratt, R. Chen, and M. Denckla, "Cognitive Profiles of Difficult-to-Remediate and Readily Remediated Poor Readers: Early Intervention as a Vehicle for Distinguishing Between Cognitive and Experiential Deficits as Basic Causes of Specific Reading Disabilities", *Journal of Educational Psychology* 88 (1996): 601-638.

[48] The reduction in eligible children is calculated by multiplying the criterion for designating a child at-risk by the number of children who would continue to need services. In Foorman, et al., "The Role of Instruction in Learning to Read," this is .18 times .30 equals .054.

[49] See J.K. Torgesen, C.A. Rashotte, and A.W. Alexander, "Principles of Fluency Instruction in Reading: Relationships with Established Empirical Outcomes," in *Time, Fluency, and Dyslexia*, ed. M. Wolf (Parkton, MD: York Press, in press).

[50] See L. Fuchs and D. Fuchs, "Treatment Validity: A Simplifying Concept for Reconceptualizing the Identification of Learning Disabilities," *Learning Disabilities Research and Practice* 4 (1998): 204-219.

[51] This issue has been discussed since the advent of the idea of early identification. See P. Satz, H.G. Taylor, J. Friel, and J.M. Fletcher, "Some Developmental and Predictive Precursors of Reading Disabilities: A Six Year Follow-up," in *Dyslexia: An Appraisal of Current Knowledge*, eds. A.L. Benton and D. Pearl (New York: Oxford Press, 1978), 313-348; A.A. Silver, "Prevention," ibid. at 349-377; and J.J. Jansky, "A critical review of 'Some Developmental and Predictive Precursors of Reading Disabilities,'" ibid. at 377-395. A more contemporary discussion is in D. Speece and L.P. Case, "Classification in Context: An Alternative Approach to Identifying Early Reading Difficulty" (unpublished manuscript).

[52] See M. Pressley and R. Allington, "What Should Reading Instructional Research Be the Research Of?" *Issues in Education* 5 (1999): 1-35. See the responses in the same issue by B.R. Foorman, J.M. Fletcher, and D.J. Francis, "Beginning Reading is Strategic and By Design Multi-Level"; G.R. Lyon, "In Celebration of Science in the Study of Reading Development, Reading Difficulties, and Reading Instruction: The NICHD Perspective"; J.K. Torgesen, "Placing NICHD-Supported Research on Reading With the Proper Context"; and F.R. Vellutino and D.M. Scanlon, "Focus, Funding, Phonics—What's the Point?"

[53] See M. Fullan and M. Miles, "Getting Reform Right: What Works and What Doesn't," *Phi Delta Kappan* 74 (1992): 745-752; B. Rowan and L.F. Guthrie, "The Quality of Chapter 1 Instruction: Results From a Study of Twenty-four Schools," in *Effective Programs for Students at Risk*, eds. Robert E. Slavin, N. L. Karweit, and N.A.

Madden (Boston, MA: Allyn and Bacon, 1989), 195-219; and R. Weatherly and M. Lipsky, "Street-level Bureaucrats and Institutional Innovation: Implementing Special Education Reform," *Harvard Educational Review* 47 (1977): 171-197.

[54] See S.L. Hall and L.C. Moats, *Straight Talk About Reading* (Chicago, IL: Contemporary Books, 1999).

[55] See U.S. Department of Education, *Twenty-first Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act* (Washington DC: U.S. Department of Education, 1999).

[56] These issues are extensively discussed by V.W. Berninger and R.D. Abbott, "Redefining Learning Disabilities: Moving Beyond Aptitude Achievement Discrepancies to Failure to Respond to Validated Treatment Protocols," in *Frames of Reference for the Assessment of Learning Disabilities*, ed. G.R. Lyon (Baltimore, MD: Paul H. Brookes, 1994), 143-162; and F.R. Vellutino, D.M. Scanlon, and E.R. Sipay, "Towards Distinguishing Between Cognitive and Experimental Deficits as Primary Sources of Difficulty in Learning to Read: The Importance of Early Intervention in Diagnosis Specific Reading Disability," in *Foundations of Reading Acquisition and Dyslexia*, ed. B. Blachman (Mahwah NJ: Erlbaum, 1997), 347-380.