answer is that Harm and Seidenberg’s model pooled the input from both sources for almost all words. Given orthographic input, the semantic pattern that was computed reflected the joint effects of both pathways. This property contrasts with the independence of the orthography-semantics and orthography-phonology-semantics pathways in race models (Paap & Noel, 1991), in which meaning is accessed by the process that finishes first. The connectionist model performs more efficiently, using both pathways rather than either one in isolation; thus, it is a question not of which pathway wins the race, but rather of how the pathways cooperatively solve the problem.

Early in the model’s training, semantic activation is largely driven by input from the orthography-phonology-semantics pathway. The phonology-semantics component is trained prior to the introduction of orthography on the view that prereaders possess this knowledge from their use of spoken language. The orthography-phonology mapping is easy to learn because the codes are highly correlated; the orthography-semantics pathway takes longer to become established because the mapping is more arbitrary. Over time, however, the orthography-semantics pathway begins to exert its influence, particularly for high-frequency words. Note, however, that what changes is the relative division of labor between the two pathways; there is some input from both pathways for almost all words.

In summary, the division-of-labor model explains why the phonological pathway predominates in early reading. However, it also contradicts the intuition that the orthography-semantics association is too arbitrary to play a useful role. Given the cooperation between the pathways, the orthography-semantics pathway only has to be good enough to clean up the pattern activated via phonology. When the model is trained to a high level of proficiency, both pathways contribute significantly.

**Summary**

Connectionist models have provided insights about many aspects of normal reading and reading impairments. The models have brought new ideas about learning and information processing into discussions of reading, lending support to some claims (e.g., about the role of phonology in reading ability and disability) while challenging others (e.g., that rule-governed forms and exceptions are processed by distinct subsystems). Although considerable progress has been made, the models raise many questions that need to be addressed in future research. The models do not address all aspects of reading; their implications concerning instruction and remediation have not been explored in depth; and it will be necessary to link the models more closely to the evidence concerning the brain bases of lexical processing that is emerging from neuroimaging (see the previous discussion in The View From Cognitive Neuroscience). The goal of developing an integrated account of reading behavior and its brain bases, with computational models providing the interface between the two, nonetheless seems a realistic one and is likely to be the focus of considerable research.

**METHODS OF TEACHING READING**

Much of the history of reading instruction in the United States has involved two general methods: whole-word instruction and phonics instruction. However, meaning-emphasis instruction, and especially whole-language instruction, has dominated the philosophy of training of reading teachers over the past 20 years. Originally, the time-honored ABC method was used to teach reading for about 200 years. This method was a basic type of phonics instruction in which children were taught letter names, then simple syllables, then words. The child would spell the syllable and then pronounce it: “double-you-ay-ell—wall.” Later, more syllables and words were mixed in, usually with the same spelling requirement prior to pronunciation. The New England Primer, Webster’s Spelling Books, and McGuffey’s Readers were the major sources of reading programs from the 1700s until the 1900s. Pictures were introduced into these programs, but for the most part the emphasis was on phonics drill. Although there is little evidence indicating how successful the ABC method was in teaching reading, there apparently was some dissatisfaction with it because educational reforms in the late 19th century led to the whole-word method becoming the predominant method of teaching reading. More recently, the whole-word method has been supplanted by whole-language instruction. In this section, we describe each method of instruction.

**Whole-Word Instruction**

To some extent, ideas about whole-word instruction are congruent in a general way with facts about spoken language. Spoken language is an almost continuous stream of sound with little or no silence separating the individual words, a fact that is especially noticeable when one tries to pick out word boundaries in a foreign language. However, compared with phonemes, words are more readily detected as units, and children come to recognize the spoken word as a meaningful unit. The relative invisibility of phonemes encouraged the view that whole words are the appropriate units for instruction. Typically in this kind of instruction, the child is shown a flash card with a word on it, and the teacher pronounces it and asks the child to say it. Generally, the teacher starts with a small set of words and gradually expands the set.

Another argument that has been used to support the whole-word approach is the low reliability of letter-to-phoneme mapping, a complex issue that we discussed in previous sections. The irregularity of English spellings, which occurs mainly in the vowel system, allows the word pint a different pronunciation than most words that end in int, which are pronounced as in hint. Similarly, have is irregular because most words that end in owe are pronounced as in gave. Irregular words such as pint and have, in any approach to teaching reading, must be learned at least partly in terms of their distinctive properties. The whole-word approach generalizes this approach to learning to read all or most words.
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Advocates of the whole-word approach have also argued that it promotes reading for meaning at an early stage of reading. Words have meanings; speech sounds do not. When a child has developed a small sight vocabulary, this vocabulary is deployed in various combinations to construct meaningful sentences, and new words are introduced so that the context clarifies their meaning. The pronunciation is given by the teacher, who indicates, wherever possible, the similarity in spelling between the word to be read and a word already in the sight vocabulary. This makes it possible (after an initial sight vocabulary is established) to emphasize that the letter symbols represent sounds.

Phonics Instruction

Phonics instruction, in its purest form, starts with a limited set of correspondences between letters and speech sounds. These letters are used immediately to build many different kinds of words. In this way, phonics instruction takes advantage of the productive aspects of alphabetic writing systems. Gradually, more letters are added, and then consonant digraphs (th, ch) and eventually consonant clusters (st, tr) are introduced. As simple words are presented over and over, the child also naturally develops a sight vocabulary during these early stages, but the development of a sight vocabulary is largely incidental in phonics instruction (much as knowledge of the alphabetic principle is incidental in whole-word instruction). The individual letters are taught by the sounds they make, and then children are induced to blend the sounds of novel letter combinations.

The main rationale behind a phonics approach is that it explicitly teaches children both the alphabetic principle and the specific letter-phomeme correspondences that generalize across many English words. An additional benefit of phonics is that it promotes an analytic approach to words that can serve the child in encounters with unknown words. One criticism of phonics, repeated for more than 100 years (M.J. Adams, 1990), is that it is boring for the child. The reason for this criticism is the emphasis phonics places on letter-sound correspondences at the expense of reading for meaning. However, this complaint is more often about the practice of phonics lessons, which are often derided as "rote drill," than about the essence of the approach. The teaching of letter-phomeme correspondences is not the same as "phonics drills," as consumers of computer-based phonics programs can attest. Certainly, some forms of practice at producing phonemes and blending them together into a word may at times be boring for children (just as learning basic math facts may be boring). But learning to read new words independently can be very rewarding for children.

Meaning-Emphasis Instruction

In general, meaning-emphasis programs focus on language experiences of the child. Thus, the child dictates short stories and is taught to read the words he or she has dictated. Instruction in learning individual words usually emphasizes memorizing whole words, though some phonics drill may be incorporated into the program at later stages.

Within the class of meaning-emphasis programs are whole-language instruction and an earlier related approach, the psycholinguistic approach, based on the work of Goodman and Smith (Goodman, 1970, 1986; Smith, 1971, 1973; Smith & Goodman, 1971). Goodman suggested that reading is a "psycholinguistic guessing game" in which readers try to figure out the meaning of a text by using a variety of partly redundant cueing systems. There are three types of cues in this guessing game: semantic, syntactic, and graphophonemic. The graphophonemic cues represent general knowledge of spelling-sound relations; the syntactic cues represent knowledge of syntactic patterns and the markers that cue these patterns (such as function words and suffixes); and the semantic cues represent knowledge about word meanings and the topic. More recently, Goodman's ideas have been incorporated into the larger whole-language instruction movement. This type of instruction, like other meaning-emphasis approaches, relies heavily on the child's experience with language. Children are encouraged to guess words that are presented in the context of short stories, and the primary motivation of the method is to make reading fun for the child. Whole-language teaching typically includes frequent oral reading by the teacher and the use of authentic literature, rather than decodable text.

In an approach that otherwise avoids any specification of what should be taught, Goodman and Smith provided one clear suggestion: Phonics should not be taught. Furthermore, they argued that children should not be corrected when they make errors reading words. Neither the development of phonological awareness in general nor the development of specific knowledge about letter-sound correspondences is a priority in whole-language instruction. Whole-language advocates do not deny that phonological awareness and phonics knowledge are components of reading (though they are not considered as central to the process as the research findings indicate). But they do deny that the explicit teaching of phonics is necessary. Their basic argument is that explicit teaching of phonics does more harm than good to beginning readers because many of them find phonics somewhat difficult and boring.

Whole-language proponents suggest that the knowledge necessary for skilled reading—including phonics knowledge—can develop in the same natural way that spoken language develops. Weaver (1994), for example, in a book aimed at elementary-school teachers, wrote: "Just as they learn the patterns of oral language, so most children will unconsciously learn common phonics patterns, given ample opportunity to read environmental print and predictable and enjoyable materials, and ample opportunity to write with invented (constructive) spelling" (p. 197).

The various tenets of whole-language teaching are a set of interrelated ideas that suggest a coherent perspective. The logic is as follows: (a) Reading is a natural extension of language; (b) explicit teaching of phonics treats reading as a technical ex-
exercise rather than a natural extension of learning and thus has the potential to do harm by boring and frustrating the child; (e) explicit teaching of phonics is unnecessary for learning; (d) therefore, explicit teaching of phonics should be avoided; and (e) because phonics represents just one of several redundant cuing systems, if a child fails to learn some piece of phonics knowledge, other cuing systems will fill in the gaps when the child actually reads.

The problem with this method lies not in the logical connections among its tenets, but in the extent to which they are true. Goodman’s suggestion that skilled reading is a psycholinguistics guessing game, for example, has largely been refuted by research on skilled reading, which demonstrates that skilled reading is not a guessing game and that phonological information is critically important in word identification. In fact, the three cuing systems are not equivalent in determining what word is actually read; the graphophonic mechanism plays a highly prominent role, particularly in reading acquisition. Furthermore, the view that learning to read, like learning to speak, is a natural act that the child teaches him- or herself how to do stands in marked contrast to the view more common among researchers—that learning to read is not a natural act (Gough & Hillinger, 1980; A. Liberman, 1999), and is very different from learning to speak, which is effortless and automatic for almost all children brought up in normal circumstances. No child needs a teacher to show him or her how to speak. It is sufficient to be a normally developing human being surrounded by other human beings speaking their language.

Learning to read presents an entirely different picture. All schools of thought agree that some amount of teaching is often (or even always) necessary. In particular, learning to read often requires some explicit instruction in the alphabetic principle. Contrast this with learning to speak. No child needs to be taught the phonemes of his or her language, but every child needs to be taught the symbols that make up his or her writing system. That is why there is an alphabet song, but not a phoneme song. Furthermore, though all human societies have language, many do not have reading and writing.

It should be clear that we have some fundamental disagreements with some of the claims made by whole-language advocates. However, to this point, we have presented only arguments regarding the possible efficacy of whole-language instruction. In a later section, we review research findings more directly. Here we do want to note some positive contributions of the whole-language movement (more recently called literature-based instruction). First, and foremost, whole-language advocates have focused attention on the need to ensure that children are enthusiastic about books and eager to learn to read. They may go too far in their reliance on enthusiasm and eagerness as components of the process of learning to read, but no one can doubt the importance of these components, and whole-language proponents have been largely responsible for the growing trend to make reading instruction more meaningful. Furthermore, they have replaced an emphasis on the teacher as an agent of instruction with an emphasis on the child as an agent of his or her own learning. Certainly, appreciating the mutual roles of learner and teacher is an important step in establishing effective reading instruction, even if learning to read is not natural and spontaneous.

**WHAT HAPPENS IN CLASSROOMS DURING READING INSTRUCTION?**

The way we have discussed different methods used to teach reading may have implied that the method adopted determines what actually goes on in the classroom. However, many good teachers are adaptive rather than rigid in their approach to teaching children and only loosely base their instruction on a given method. They know by instinct that when learning is made meaningful and exciting, children learn more. It should also be noted that most schools are populated by a couple of generations of teachers who were taught that whole-language instruction is good and phonics is evil. So teachers may be asked to teach phonics and not know how, which also affects what happens in classrooms.

These days there are a large number of commercially available reading programs in schools. Because these programs can be rather expensive and because bulk buying is generally cheaper than buying different programs for different schools, school districts often adopt a single program for districtwide use. These programs, called basal reading series, consist of teacher guides, student materials (e.g., minibooks, anthologies, and workbooks), and ancillary materials (e.g., letter cards, posters, and CDs). Although each reading program generally adheres to one particular method for teaching reading, within individual classrooms, teachers have some flexibility in what they actually do if they are trained in a variety of methods.

The key word currently used to describe classroom reading instruction is balance. Reading instruction that balances instruction in phonics with exposure to good literature and opportunities to write is found more and more in classrooms. However, what balanced reading instruction involves in practice varies with respect to the explicitness with which skills are taught, the kinds of materials used to practice these skills, the size of the instructional group, and the extent to which assessment informs instruction. Truly balanced instruction should integrate skills instruction with reading for meaning and opportunities to learn (Snow, Burns, & Griffin, 1998). However, what often happens in primary-grade classrooms is a fragmentation of the literacy curriculum into activities based on the latest teacher training workshop. More generally, variations in actual classroom practice roughly fall under two approaches to teaching that we call prescriptive (direct) versus responsive teaching.

**Prescriptive Teaching**

Reading instruction that explicitly or directly teaches skills such as letter-sound correspondences typically consists of a
curriculum with a prescribed set of activities, which together are called a scope and sequence. Across kindergarten and first grade, the curriculum systematically introduces phonological awareness and phonic skills with practice in decodable texts (containing letter-sound correspondences taught by the teacher). Beyond second grade, there is still some phonic instruction but not in reading instruction.

Instruction based on prescriptive teaching may vary in the amount of whole-class versus small-group instruction and in the amount of assessment. For example, the Open Court (2000) basal reading series emphasizes whole-class instruction and additional independent practice, with little emphasis on assessment. In contrast, in Reading Mastery (Englemann & Bruner, 1995) reading instruction takes place in groups of six based on placement tests. The school-reform model Success for All (Slavin, Madden, Dolan, & Wasik, 1996) has multiple grouping formats—whole-class instruction according to reading level determined by 8-week assessments, partner reading, independent reading, and collaborative group work.

First-grade teachers adhering to prescriptive techniques tend to plan their lessons around the following activities: (a) review of letter sounds previously taught, (b) introduction of new letter sounds, (c) practice blending sounds into words, (d) practice reading in decodable texts, (e) teacher read-alouds from children's literature to teach vocabulary and comprehension strategies, and (f) language arts (spelling, writing, grammar, and mechanics). For example, in the Open Court reading program, the teacher introduces /el/ (which corresponds to the linguistic symbol /el/) spelled e by hanging the sound-spelling card hen on the wall (along with the other sound-spelling cards already introduced). The capital and lowercase printing of the letter (E e) is at the top, the picture of the keyword—hen—appears below, and in a green field at the bottom is the printed letter e (see Fig. 10). The children have been taught that the green field denotes short vowel sounds.

At the start of the lesson, the teacher reads the decodable story Jen's Hen—"Jen's pet hen likes to peck, peck, peck. She pecks at a speck on the new red deck. This is how her pecking sounds: /el/ /el/ /el/ /el/ /el/". Then, the teacher asks the children to listen to words and to signal thumbs-up when they hear a word that has the /el/ sound at the beginning or at the middle of the word. So, the children give a thumbs-up to ever, each, every, and echo, but not hand or flavor, for /el/ sounds at the beginning, and a thumbs-up for hen, pest, wet, desk, next, bed, and feather, but not for tape or bike, for /el/ sounds at the middle of the word. In the next step, the teacher has the children blend words (both in isolation and in sentences) that contain short e. A specific procedure is outlined for teaching blending. For example, to blend fed, the child is taught to isolate the initial sound (/f/) and the medial sound (/ed/), then to combine them (/fed/) before adding the final sound (/d/) to produce the entire word (/fed/d/). Finally, the phonics lesson ends by practicing the accumulating letter sounds in Jen's Pen (see Fig. 11). Before reading the story, the teacher reviews the high-frequency words.

Fig. 10. A first-grade teacher pointing to the sound-spelling card for /el/ in Open Court Reading (2000)
oral reading errors, but also responds to an error by extending the child’s knowledge of the alphabetic system. Furthermore, the responsive teacher keeps a running record of reading miscues to inform the next day’s alphabetic activities of making words and breaking words into constituent elements. Because instruction in alphabetic coding is conducted incidentally in the context of reading books, responsive teaching methods inherently lack a systematic approach to phonics instruction. The absence of sequential instruction and practice makes it difficult for many children to acquire and transfer decoding skills.

Responsive teaching can be highly effective when knowledgeable teachers work with individual children. But responsive teaching in the hands of a teacher who does not have the knowledge to seize the moment productively or who is teaching a large group of heterogeneous readers may be ineffective with the lower-achieving students. A popular system for responsive teaching at the classroom level is Guided Reading (Fountas & Pinnell, 1996). Guided reading starts with whole-class discussion of a reading selection to elicit prior knowledge and introduce difficult vocabulary. Then the teacher scaffolds children’s reading of the passage in whole-group, small-group, or partner-reading formats. If a small-group format is adopted, children work in centers or independently while the teacher works with one reading group after the other.

The current basal reading series have accommodated guided reading by providing leveled text (i.e., texts that are ordered by difficulty, according to a number of factors such as number of words, predictability of syntactic patterns, word frequency, and picture clues). These texts stand in contrast to the decodable texts of the prescriptive approach because they are selected for their sense of story and predictable syntactic patterns, and words are selected for frequency, not for sound-spelling patterns. But the issue of what makes text decodable for which readers at which phase of reading development is a largely unanswered empirical question (Juel & Roper/Schneider, 1985; Pearson, 1999). An example of leveled text is shown in Figure 12. The pages in this figure are from the story The Bus Ride (Scott, Foresman and Company, 1976), which is appropriate for mid-fall of first grade. In contrast to Jen’s Pen (Fig. 11), which shows tight control on vocabulary with an emphasis on the le/ sound from the lesson and previously taught letter-sounds, The Bus Ride emphasizes the predictable pattern “got off/on the bus.”

Because of the new emphasis on phonological awareness and phonics, guided reading now includes a separate emphasis on words (P.M. Cunningham, 1995; Fountas & Pinnell, 1998). This means that in addition to guided reading, independent reading, and process writing blocks of an integrated reading-language period, many primary-grade classrooms now include a block of time devoted to word-level activities. During this daily block, the teacher teaches children how to read and spell high-frequency words and discusses strategies for decoding and spelling. P.M. Cunningham (1999) developed a curriculum of activities for word work (e.g., organizing words on a wall

Ted has his hen in a pen.
Ted’s hen is Jen.
Jen’s pen is a mess.

Fig. 11. Page 3 from the phonics minibook Jen’s Pen. From Collections for Young Scholars, by Open Court Reading, 2000, Chicago: SRA/McGraw-Hill. Copyright 2000 by SRA/McGraw-Hill. Reprinted with permission.

would, my, did, laugh, out, her, of, and move and teaches two new nondecodeable words, darts and feeds. The teacher notes that one word with a variant spelling for “short e” (i.e., _ea_ in bread) is included in the story. This emphasis on decoding instruction is complemented in the grammar section of the lesson by teaching children to encode the sound-spelling le/ through dictation practice.

Responsive Teaching

In contrast to prescriptive teaching, responsive teaching is loosely based on the constructivist notion of scaffolding (see Foorman, Francis, Shaywitz, Shaywitz, & Fletcher, 1997, for further discussion). Rather than working from a scope and sequence, the responsive teacher responds to what the child is perceived to need at the moment in the context of reading real books. The teacher provides a scaffold against which the child can construct knowledge of reading. Like whole-language instruction, responsive teaching is steeped in the belief that children inherit three cuing systems (syntactic, semantic, and graphophonic knowledge) from their oral language abilities. For example, in the tutorial program Reading Recovery (Clay, 1993), the classroom teacher not only provides feedback on.
Fig. 12. Four pages from *The Bus Ride*. The top left panel is the second page of text in the book. The top right panel shows the third page. The book continues with a number of animals getting on the bus, followed by the page (p. 22 in the book) in the lower left panel, which emphasizes the predictable sequence "the [animal] got off the bus." The lower right panel (p. 24 in the book) shows the different animals in the story. From *The Bus Ride*, by Scott, Foresman and Company, 1976, Glenview, IL: Pearson Group. Copyright 1976 by Scott, Foresman and Company. Reprinted with permission.

chart according to letter-sound patterns, building words with magnetic letters, using words you know, guessing the missing word in a sentence). These activities all emphasize analogical reasoning around onsets and orthographic rimes, in contrast to the synthetic phonics approach taken by the majority of prescriptive teaching approaches. That is, a responsive teacher will have children sort printed words by initial sounds and then by word families (such as the *ould* in *could*). The danger is that
these strategies can result in a look-at-first-letter-then-guess decoding strategy such as pronouncing shot as ship or categorizing only by times (make, bake, rake) rather than also by vowel spellings (make, pain, play, eight). Full mastery of the alphabetic system requires understanding how spellings represent speech sounds, and the inconsistency of this mapping for vowels provides a challenge for beginning readers of English (see Fig. 2). However, as we discuss in the section on research findings, there is an adequate empirical base to support phonics over nonphonics instruction, but not an adequate base to support one type of phonics instruction over another (e.g., synthetic vs. analogical).

Summary: Balanced Reading Instruction

In the first years of the new millennium, the language of balanced reading instruction has swept America’s classrooms and basal textbook market. However, underlying the rhetoric is the reality of the debate over reading methods. Prescriptive teaching follows a scope and sequence of phonic elements, with texts based on the accumulating set of letter-sound correspondences taught. Descriptive teaching eschews a scope and sequence in favor of strategies that enable the child to construct meaning in texts leveled by difficulty according to a number of factors (such as word frequency). Recently, responsive teachers have begun to attend more to word-level work that emphasizes an analogical approach to reading and spelling words and are often turning to phonics kits to supplement their letter-sound instruction. Unfortunately, the continued dichotomy of reading philosophies produces fragmented instruction in classrooms rather than the integrated balance of skills and meaningful applications that research suggests are needed to produce successful readers.

READING INSTRUCTION IS A POLITICALLY CHARGED ISSUE

During the 1990s, concerns about the effectiveness of reading instruction led to what are often called reading wars in a number of states where state officials became very involved in debates about reading instruction. In this section, we focus on Texas, California, and Massachusetts as examples of how politically charged the issue is. We also note that concerns among many parents have led to increased enrollments in many private schools. In general, this trend has occurred because many private schools have relied on phonics instruction, whereas many public school systems have used whole-language approaches to teaching reading.

Because of their large populations, Texas and California have had special status since the 1960s in decisions regarding the adoption of basal readers. The readers adopted by school districts in Texas and California often become the textbooks for the entire nation. Both states have grass-roots parents organizations and business coalitions that push educational agendas which affect national educational policy (such as California’s Proposition 227 ending bilingual education in 1998). In Texas, the classic example of a politician involved in educational issues is Ex-Governor George W. Bush, who made education (and, in particular, reading) the focus of election campaigns, with a rallying call of “All children shall read at or above grade level by third grade!”

In the 1980s, the book A Nation at Risk: The Imperative for Educational Reform (National Commission on Excellence in Education, 1983) inspired a number of educational reforms. In Texas, the legislature passed reforms establishing minimum passing scores for courses and tests, minimum competency tests for teachers, and a “no pass—no play” rule that prohibited students who failed from participating in extracurricular activities. Legislation established an accountability system tied to students’ performance on statewide tests and the development in the early 1990s of the Texas Assessment of Academic Skills (TAAS). Much has been written (see McNeil, 2000) about Texas’s experience with the TAAS as the epitome of the negative consequences of high-stakes testing (e.g., bonuses to administrators and bribes to students led to test anxiety, cheating, and TAAS-oriented curriculum). However, the public display of TAAS results school by school in local newspapers and across the state in the magazine Texas Monthly resulted in a grassroots movement for parent and student accountability in school reform at the local and state level. Much of this grassroots movement was a cry of “We want more phonics!” directed at local school boards and the state board of education. In fact, phonics advocates joined forces with social conservatives on the state board of education to try to mandate a phonics-oriented scope-and-sequence set of standards. Although this attempt failed, the social conservatives and phonics advocates were successful in passing a mandate that first-grade texts selected during the basal-reader adoption process be 80% decodable.

Texas also institutionalized its reading initiative at the local district level. This was accomplished through several steps. First, a reading czar, who reported directly to the commissioner of education, was appointed at the Texas Education Agency, and this model was followed by several of the large school districts across the state. Second, the governor’s office worked with the legislature to fund reading-related initiatives, such as early-reading assessments, early-reading interventions, and 4 days of professional development for the state’s 40,000 kindergarten through second-grade teachers. Third, the state’s curriculum standards were approved by a consensus committee, and textbooks that were subsequently adopted were aligned with the state standards. Fourth, coalitions of business leaders, university researchers, and professional educators used TAAS data and research findings to spearhead school reform in low-performing schools. At each step, districts are expected to make their own decisions about how state directives will be achieved. For example, districts can use “accelerated learning” funds for whatever early-reading intervention programs they want, but are held accountable for student outcomes. Additionally, dis-
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districts choose from the commissioner's list of approved instruments which early-reading assessment will be administered.

In contrast to Texas's local-control approach to reading reform, California implemented a top-down approach that was a result of the state's plummeting scores on national assessment tests. From the early 1980s to 1994, California went from near the top to near the bottom in national comparisons. In 1995, the state superintendent of public schools put together a reading task force that prepared guidelines for reading reform. In that same year, the legislature passed the ABC Bill, which mandated explicit teaching of phonics, spelling, and math. This was followed by legislation providing money for staff development for teachers and administrators in effective early-reading techniques, including techniques for systematic, explicit instruction in phonics. In 1996, the California Department of Education released a program advisory on reading and language arts instruction, which was followed by the Reading/Language Arts Framework in 1999. Both documents were written by outside experts. While all of this was going on, California was also reducing class size, setting up an accountability system, calling for another textbook adoption, and eliminating bilingual education. With so much change occurring so fast, it is not surprising that California's reading-reform movement was severely criticized by university faculty and teachers (see Dressman, 1999; Mathes & Torgesen, 2000).

In Massachusetts, the situation was slightly different. Public education in Massachusetts has traditionally been much more decentralized than in Texas or California. There has typically been no statewide textbook adoption, and little history of state involvement in curriculum choice. These matters have been largely left up to local school systems. The 1993 passage of the Massachusetts Education Reform Act was thus a notable departure from tradition. Education reform promised major increases in state funding for public education. In exchange, local school systems were required to meet new state curricular standards, which were to be drawn up by committees appointed by the Massachusetts Department of Education and approved by the state Board of Education. The standards were to be enforced through a program of statewide testing.

Despite the traditional lack of centralized control, the curriculum in Massachusetts public schools looked rather uniform across the state. This is understandable: As everywhere, teachers and administrators took similar courses at the same handful of universities, attended the same workshops, and bought the same textbooks, responding to national trends and fashions. Consequently, reading instruction in Massachusetts was strongly influenced by the whole-language movement in the early 1990s. It is thus not surprising that the committee of educators charged with drawing up the curriculum framework on English language arts produced a document heavily influenced by the whole-language approach. The document that they produced contained no mention whatsoever of the scientific literature on reading, yet claimed support from research. It highlighted the idea that children could learn to read the same way they learned to talk—and presented a vision of language acquisition that attributed the process to curiosity and enthusiasm alone. Crucially, the document claimed support from research on language.

In the past, research focused on the components of language—phonological and grammatical units. As a result, we understood and taught the language processes as separate entities characterized by discrete skills. More recently, language researchers have shifted their focus to study language from the perspective of its primary function—communication (Massachusetts Department of Education, 1995, p. 14).

By analogy, the same shift was endorsed in reading instruction.

As it happens, Massachusetts is home to well-known centers of research in linguistics and the psychology of reading at the Massachusetts Institute of Technology and the University of Massachusetts at Amherst. Once the content of the proposed curriculum document became known to some of these researchers, a letter signed by 40 researchers in linguistics and psychology was sent to the Commissioner of Education on July 12, 1995. The letter objected to the document's claims about language and reading:

We want to alert the educational authorities of Massachusetts to the fact that the view of language research presented in this document is inaccurate, and that the claimed consequences for reading instruction should therefore be subjected to serious re-examination.

The facts are as follows. Language research continues to focus on the components of language, because this focus reflects the "modular" nature of language itself. Written language is a notation for the structures and units of one of these components. Sound methodology in reading instruction must begin with these realities. Anything else will shortchange those students whom these standards are supposed to help.

We are concerned that the Commonwealth, through its powers to set standards for schools, should presume to legislate an erroneous view of how human language works, a view that runs counter to most of the major scientific results of more than 100 years of linguistics and psycholinguistics. We are even more concerned that uninformed thinking about language should lie at the heart of a "standards" document for Massachusetts schools.

By chance, the letter came along just as the reading wars were heating up in other states, and attracted considerable attention. Massachusetts responded quite positively, first revising its curriculum framework and finally rewriting it completely. The Commonwealth's curriculum document (though controversial in other ways) has won praise for being a lucid and scientifically accurate description of the reading process that at least points to acceptable standards for early-reading instruction. In a sense, the Massachusetts story represents a victory for sound educational practice. Nonetheless, it is unclear how much has really changed for Massachusetts schoolchildren now that Massachusetts has a scientifically sound document underlying its standards for reading instruction. The most recent round of state testing continues to reveal harsh differences between rich and poor communities in reading achievement, and there is little sign that teachers are being educated about the research lit-
erature that underlies the commonwealth's current standards document.

Massachusetts, Texas, and California each reveal part of the way out of the reading wars. It is helpful when the research community is mobilized and gets itself involved, as happened in Massachusetts. But researchers do not make policy and do not teach young children to read. For true progress, there must be guidance from above, as in California, supporting and fostering strong local interest and enthusiasm from both parents and teachers, as in Texas.

Many obstacles stand in the way of this sort of progress. One is the peculiar alignment (particularly in North America) of phonics with conservative politics. Considerable publicity for the Massachusetts researchers' letter was generated by conservative newsletters and Web sites (a bit of an irony for a letter signed by 40 Massachusetts professors, including several well-known leftist activists). In like fashion, writings from the whole-language community proclaim that the essence of this approach lies not in its particular ideas about reading, but in its "belief in the empowerment of learners and teachers" and the "acceptance of all learners and the languages, cultures and experiences they bring to their education" (Whole Language Umbrella, 2000)—as if a pedagogy based on the alphabetic principle was inevitably inconsistent with empowerment and acceptance. In reality, of course, the pedagogy that empowers most is the pedagogy that teaches best.

RESEARCH FINDINGS ON TEACHING READING

We turn now to research findings related to how to best teach reading skills. We begin by reviewing two well-known summaries of research on teaching reading and then providing overviews of the findings of two recent reports on the issue: the National Reading Panel (NRP, 2000) report and a report of the National Research Council (NRC) called Preventing Reading Difficulties in Young Children (Snow et al., 1998). We then turn to a discussion of laboratory and classroom studies.

Meta-Analyses of Teaching Reading

The questions surrounding how reading is most effectively taught have been the object of several comprehensive reports over the years, including two major books (M.J. Adams, 1990; Chall, 1967). The question at the center of Chall's "Great Debate" review was, what does evidence have to say about the effectiveness of direct instruction—explicit phonics—compared with whole-word instruction or implicit phonics? Should beginning instruction focus on directly teaching the correspondences between letters and sounds (phonomes)? The logical answer to this question appears to be that these correspondences, and the alphabetic principle they instantiate, should be the central initial focus of instruction. However, the tendencies of actual practice have been otherwise. As noted earlier, a variety of alternative pedagogies have emphasized instead meaning-focused instruction built around story reading, exposure to print, and enhanced language environments. These alternatives are also varied to capture with a single characterization. For example, when Chall coined the term Great Debate in 1967, the alternative to direct instruction was whole-word teaching, in which basal readers and limited (and later) phonics instruction were typical components. In the past 20 years, the dominant alternative has been whole-language instruction. Chall's conclusion, based on a careful analysis of some 22 programs, classroom observations, and reviews of published studies, was that children who received direct code-based instruction (emphasis on decoding or phonics) tended to have higher achievement in the first three grades than did children in whole-word classrooms. Although initially, for beginning readers, whole-word classrooms performed better on measures of comprehension and reading rate, in later grades the advantage of decoding-based instruction became highly general, encompassing spelling, word recognition, and comprehension. This conclusion, in its general form, was confirmed in later less comprehensive reports.

M.J. Adams (1990) provided a thorough treatment of these research reports and, more generally, an evaluation of teaching methods in the context of research findings. Furthermore, she put the Great Debate in its historical context, and explained why there has been so much resistance to the direct teaching of decoding. An emphasis on meaning and comprehension not only coincides with the main goal of reading, but also appeals to beliefs that the child’s experience in school should reflect purposeful learning in authentic contexts. In that spirit, the exclusive use of commercially published children's literature (which is often not decodable) has become characteristic of whole-language classrooms. Modern phonics advocates point out that there is nothing incompatible between these meaning values and good phonics instruction, which aims to quickly provide the child with the basics of the letter-sound system and practice with decodable texts while at the same time introducing children's literature. Like Chall, Adams argued that phonics approaches were more successful than nonphonics approaches in teaching children to read.

The NRC report

The NRC (the research arm of the National Academy of Sciences) revisited this issue in its report Preventing Reading Difficulties in Young Children (Snow et al., 1998). Unlike reports that have focused on the question of how to teach reading, the NRC report asked how available research findings can inform recommendations directed at reducing children's reading difficulties. A distinctive feature of the NRC report was that it considered early-childhood factors. It reviewed research on early childhood, including research on parental influences on cognitive and social development, family literacy, and the role of preschools as language and literacy environments. It also reviewed the problems of teacher preparation and made specific recommendations about what teachers need to know about reading. The report reviewed studies that reported low levels of
teacher preparation in the foundations of reading. Adding to the growing call for stronger teaching preparation, the report recognized the need to improve both the college education (preservice training) and the in-service training of teachers.

Although the NRC report steered clear of specific curriculum recommendations, it emphasized the importance of promoting knowledge and practice in decoding. For example, it recommended that kindergarten instruction "be designed to provide practice with the sound structure of words, the recognition and production of letters, knowledge about print concepts, and familiarity with the basic purposes and mechanisms of reading and writing" (p 322). It concluded that research shows that beginning reading "depends critically on mapping the letters and the spellings of words onto the sounds and speech units that they represent" (p 321). Furthermore, counter to the idea that somehow comprehension can proceed on its own, the report added that "failure to master word recognition impedes text comprehension" (p 321).

The report's focus on language and literacy experiences prior to school and on the importance of decoding knowledge as a goal of beginning reading instruction achieves a meaningful balance. It is clear that coming to school with certain relevant skills (some degree of phonological awareness) and dispositions (an interest in books) eases the burden of school instruction. It is equally clear that schooling can organize its efforts along the lines supported by research, making sure that children acquire the ability to decode words and have sufficient reading practice to gain fluency and increase comprehension.

The NRP report
In 1997, the U.S. Congress asked the National Institute for Child Health and Human Development and the Department of Education to convene a committee to examine applying research to classroom practice. Topics studied by the NRP were alphabets (phonological awareness and phonics), fluency, comprehension, how teachers can be taught to teach reading better in certification and professional development programs, and the use of computer technology in reading instruction. Meta-analyses based on available data on these topics were undertaken.

The NRP (2000) study is valuable for what it found in the alphabets area and what it did not find in the other areas (the committee decided that there was generally not enough good-quality research to make valid conclusions in some areas). The report noted the validity of the research we discussed previously in the section on phonological awareness. With respect to phonics instruction, meta-analyses revealed that (a) systematic phonics instruction produces significant benefits for students in kindergarten through sixth grade and for students with reading disabilities (regardless of SES), (b) the impact of phonics is strongest in kindergarten and first grade, and (c) phonics must be integrated with instruction in phonological awareness, fluency, and comprehension. The report noted that a strong empirical base supports the importance of instruction in phonological awareness, in conjunction with phonics instruction, for the beginning stages of reading instruction. However, the report also noted that there are not enough data to draw conclusions about the best way to teach vocabulary, fluency, and comprehension, or the best way to prepare teachers to teach reading.

Laboratory Studies
The results of some important experimental studies suggest two interrelated conclusions. First, learning correspondences between letters and sounds is more productive (so there is more transfer to new words) than learning whole words, even though learning whole words may be faster at first. Second, providing instruction that lets children infer these correspondences may not be as effective as directly teaching them. The first conclusion was demonstrated by C.H. Bishop (1964), who trained two groups of adult subjects to respond to novel visual stimuli. One group learned to make phoneme responses to individual Arabic letters, whereas the other group learned to make word responses to strings of Arabic letters. In each case there was a 1:1 correspondence between the graphic stimulus and the pronunciation. In the case of single letters, the correspondence was between the letter and the phoneme; in the case of the words, the correspondence was between the printed word and its pronunciation. Although training was faster for the whole-word group than the letter-phoneme group, transfer showed the opposite result: The letter-phoneme group could read many more new words than the whole-word group.

Jeffrey and Samuels (1967) carried out a similar study using kindergarten children and a set of specially constructed letters. They found that children who had learned the sounds of individual letters could correctly read many more new words than could children whose training required them to learn whole words. Although both groups learned the intended pronunciation of the new words, the word group needed twice as many trials as the letter group to reach this level of performance.

Thus, laboratory research has long established the value of learning letter-sound correspondences for productive transfer of reading skill. Other laboratory studies with children have shown how difficult acquiring these correspondences can be in the absence of instruction (Byrne, 1984, 1996). Byrne (1991) taught young children to read one-syllable words by pairing the words with their meanings; for example, fat was associated with a picture of a fat boy and bat was associated with a picture of a bat. Then, with the pictures withdrawn, the children demonstrated that they could read the words alone. One might think that the children had inferred that the /f/ made the sound /f/, because the /f/ was the only letter that distinguished fat from bat and the phoneme /f/ was the only sound that distinguished the spoken word “fat” from “bat.” But instead, the children were unable to demonstrate that they had learned this association. When they were asked to judge whether the printed word fun said “fun” or “bun,” their responses were incorrect about as often as they were correct. Thus, in at least some conditions, children do not spontaneously infer letter-sound correspondences on the basis of being
able to read whole words. This finding reinforces the importance of teaching children directly what they need to learn.

**Classroom Studies**

Classroom studies of teaching reading typically have compared phonics instruction with some form of nonphonics (whole-word or whole-language) instruction. As noted, there have been many reviews of such research (M.J. Adams, 1990; Chall, 1967) in addition to the NRC (Snow et al., 1998) and NRP (2000) reports. All of these reviews (see also Chall, 1983, 1996; Feitelson, 1988) concluded that systematic phonics instruction produces somewhat higher reading achievement for beginning readers compared with the nonphonics alternative. Results are most impressive for students at risk for reading failure, such as children in Title I programs and those with learning difficulties.

If reviews are unanimous in their support for phonics, why does the debate continue? It continues because the debate is not just about whether the unit of instruction should be grapheme-phoneme mappings or whole words; rather, the debate is enmeshed in philosophical differences between traditional versus progressive education that divided American educators throughout the 20th century and continue to this day. The progressives, drawing upon the writings of Dewey (1938), champion student-centered learning over traditional education’s emphasis on the uniformity of method and curriculum. The whole-language movement’s emphasis on teacher empowerment, child-centered learning, and authentic literature is an outgrowth of progressive education. Likewise, its emphasis on constructivist psychology and on ethnographic and case study methodologies challenges the credibility of the empirical data-based approaches that dominate every field of scientific research (Foorman, 1995). Hence, conclusions based on classroom studies are contested on the basis of broad philosophical stances that are inconsistent with standard assumptions about research.

It is important to note that most of the whole-language movement’s educational values are not necessarily inconsistent with teaching phonics. Indeed, schools of education could include a course in the alphabetic principle and phonics instruction for teachers in training. Then these teachers could enter first-grade classrooms empowered with the knowledge necessary to teach phonics without following scripted programs or relying on worksheets (Moats, 1994). In fact, few schools of education offer such a course.

**First-grade studies**

The U.S. Office of Education conducted the Cooperative Research Program in First Grade Reading Instruction between 1964 and 1967. These studies are commonly referred to as “the first-grade studies.” Bond and Dykstra (1967) concluded from these studies that classroom approaches that emphasized (a) systematic phonics, (b) reading for meaning in vocabulary-controlled text, and (c) writing produced superior achievement compared with approaches that relied on mainstream basal readers that did not include phonics (only recently have systematic phonics instruction and decodable text been incorporated into mainstream basal reading series). They found a definite advantage for code-emphasis approaches but concluded that no single method worked for all teachers or all children. Phonics proponents emphasize the first part of the conclusion; whole-language proponents emphasize the latter part of the conclusion. Only recently have the multilevel modeling and statistical techniques become available to test for the separate and interactive effects of characteristics of students, teachers, and programs.

Evans and Carr (1985) evaluated two programs in 20 first-grade classrooms. Half of these were traditional teacher-directed classrooms in which instruction involved basal readers with phonics drills and applications. The other half were student-centered classrooms in which instruction by the teacher constituted only 35% of the day’s activity. In the latter classrooms, reading was taught primarily by an individualized language-experience method in which students produced their own workbooks of stories and banks of words to be recognized (a whole-language approach). Evans and Carr characterized these two groups as decoding oriented and language oriented. Despite some differences in emphasis regarding how teaching should be conducted, the two groups did not differ in the amount of time spent on reading tasks. The two groups were also matched on relevant socioeconomic variables, and they were virtually identical on measures of intelligence and language maturity. The clear result, however, was that the decoding group scored higher on year-end reading achievement tests, including comprehension tests. Additionally, the language-oriented group did not show higher achievement in oral language measures based on a storytelling task. The results were consistent with the Pittsburgh Longitudinal study (Lesgold & Curtis, 1981; Lesgold & Resnick, 1982), which also showed quite clearly that instruction that emphasizes the alphabetic principle does not produce word callers who are insensitive to contextual meaning.

**Effective-schoo; research**

In the late 1970s and the 1980s, several syntheses of research on effective teaching were written (Brophy & Good, 1984; Rosenshine & Stevens, 1986). Effectiveness was defined in terms of correlations between classroom processes and student outcomes. The strongest correlates of achievement were instructional time engaged in academic tasks, classroom management, and certain patterns of teacher-student interactions (Soar, 1973; Stallings, Robbins, Presbrey, & Scott, 1986). For disadvantaged students, the link between explicit instruction and achievement was notable (Stallings et al., 1986), a finding supported in other classroom-observation research (Brophy & Everton, 1978; Good & Grouws, 1975). Current reading research builds upon this research by employing longitudinal, multilevel designs that nest time within student, student within classroom, and classroom within school. By so doing, re-
How Psychological Science Informs the Teaching of Reading

Searchers are able to examine the impact of teachers and schools on the growth and outcomes of individual students over time. Thus, although the effective-schools research provides correlations between students’ time-on-task and achievement outcomes, new methodologies in the 1990s made it possible to model how teachers’ effectiveness mediates the impact of students’ initial skill levels on skill development and achievement. And by modeling these effects within schools, researchers can begin to understand why students in some schools perform so much better than students in other schools.

**Best practices**

During the heyday of the whole-language movement (the mid-1980s to the end of the 1990s), educational researchers turned away from large-scale studies of classroom instruction and instead engaged in case studies of exemplary teachers and culturally different students. Case studies of culturally responsive instruction emphasized the small-group, collaborative approaches (Au, 1980; Phillips, 1972) and the importance of relating classroom instruction to the home and community experiences of children (Delpit, 1995; Goldenberg & Gallimore, 1991; Heath, 1983).

In response to the assumption that best practices occurred in literature-based classrooms and not in skills-based classrooms, some recent research contrasted these two approaches (Morrow & Gambrell, 2000). The literature-based perspective is grounded in reader response theory (Rosenblatt, 1978), according to which readers play a central role in the construction of meaning, and in social-constructivist theory (Cullinan, 1987), according to which literacy is acquired in a book-rich context of purposeful communication. Literature-based instruction emphasizes sustained use of authentic literature for independent reading, read-alouds, and collaborative discussions. Skills-based programs, in contrast, are typically defined as traditional programs that use a commercially available basal reading program and follow a sequence of skills ordered according to their difficulty. Systematic phonics instruction falls under this definition of skills-based programs, whereas literature-based instruction is a more recent term for the whole-language approach. Literature-based instruction was found to benefit literacy acquisition in kindergarten (Castle, Riach, & Nicholson, 1994; Reutzel, Oda, & Moore, 1989) and at the elementary level (Fulop, 1991; Purcell-Gates, McIntyre, & Freppon, 1995; Reutzel & Cooter, 1990).

In sum, studies of “best practices” provided ethnographic and case studies of a small number of exemplary teachers, in contrast to the effective-schools research, which examined process-product correlations in a large number of classrooms in schools of varying SES and achievement levels.

Recently, the combination of literature-based instruction with traditional basal reading instruction has been found to be more powerful than traditional instruction alone (Dahl, Scherer, Lawson, & Grogan, 1999; Morrow, 1992; Morrow, Pressley, Smith, & Smith, 1997). In fact, balanced reading instruction seems to be replacing literature-based reading instruction (Fitzgerald & Scobit, 2000; Pressley, 1998), as the pendulum of reading rhetoric swings away from whole-language approaches toward phonics.

**Evidence-based practices**

Rather than simply describing teaching strategies of teachers nominated by peers for their best practices (or correlating processes and products as in the effective-schools research), current research is drawing on longitudinal and multilevel designs to examine the impact of student-level and teacher-level variables on skill development and achievement.

While whole-language proponents were advocating the virtues of literature-based instruction and condemning phonics and skills-based instruction in the 1980s and 1990s, researchers continued to examine how children’s reading development was affected by the interaction of their characteristics with instructional factors. These researchers (M. J. Adams, 1990; Ehri, 1998; Foorman, 1994; Harn & Seidenberg, 1999; Perfetti, 1992) addressed the complex mappings of phonology to orthography that are required when learning to read English; they also appreciated that phonics is an ad hoc system of 90 or so rules for teaching reading that provides only a beginning focus on grapheme-phoneme relations when, in fact, there are as many as 500 spelling-sound connections that must be learned (Gough et al., 1992). Because of the sheer number of these connections, self-teaching is hypothesized as the mechanism by which children continue their reading development beyond basic levels (Share, 1995; Share & Stanovich, 1995). Self-teaching assumes a foundation of phonological awareness and decoding skill upon which to bootstrap new orthographic information. Several researchers have investigated how this knowledge interacts with instruction in classroom settings. Juel and Roper/Schneider (1985) found that if the dominant instructional strategy in the classroom was decoding unknown words letter by letter, children learned the strategy quicker and went on to infer untaught letter-sound relations faster if their beginning reading textbooks contained decodable text. This was particularly true of children with low initial levels of skill.

Foorman, Francis, Novy, and Liberman (1991) found that students in three first-grade classrooms with more letter-sound instruction improved at a faster rate in reading and spelling than students in three first-grade classrooms with less letter-sound instruction. Initial scores on phonemic segmentation tasks predicted reading and spelling outcomes for all children. Exploratory data analysis revealed that children who were slow to improve in phonemic segmentation were also slow to spell and read phonetically, especially among children receiving less letter-sound instruction (Foorman & Francis, 1994).

In a subsequent study, Foorman et al. (1998) examined the reading development of 285 first and second graders in 66 classrooms in eight Title I schools to determine how the nature of letter-sound instruction interacted with entering skill in phonological awareness. These students scored in the bottom 18% on the district’s early literacy assessment. Some teachers par-
participated in one of three kinds of experimental classroom reading programs, and some participated in an unseen control group involving the district’s standard curriculum. Instruction in all four groups included a language arts emphasis on writing and read-alouds from good-quality literature. The three types of experimental programs were differentiated by the kind of phonics instruction: (a) direct instruction in letter-sound correspondences practiced in decodable text (direct code), (b) less direct instruction in systematic sound-spelling patterns embedded in authentic literature (embedded code), and (c) implicit instruction in the alphabetic code while reading authentic text (implicit code). The 53 teachers for these three groups participated in ongoing generic staff development as well as training specific to their program. The remaining 13 teachers participated in the district’s whole-language staff development, and their students formed a control group for the implicit-code approach.

Children receiving direct-code instruction improved in word reading at a faster rate and had higher word recognition skills than those receiving implicit-code instruction. The improvement was particularly impressive for students who began the year with low phonological awareness. Children receiving direct-code instruction, in contrast to children in the other groups, also had word-reading and reading comprehension skills that approximated national averages at the end of the year. Despite the direct-code group’s generally good outcomes, 35% of them remained below the 30th percentile in reading achievement. Torgesen (2000) multiplied the percentage of students remaining below the 30th percentile (35% in this case) by the percentage of the distribution of reading scores represented by the students at the beginning of the year (18% in this case) to derive a population-based failure rate. Accordingly, Torgesen computed the population-based failure rate for the Foorman et al. (1998) study as 6% (35% × 18%). Fletcher and Lyon (1998) pointed out that a failure rate of 6% represents a substantial reduction in the 15% to 20% of students with reading difficulty in the United States. The finding that explicit instruction in letter-sounds can prevent reading difficulties for children at risk for reading failure because of poor phonological awareness or lack of home literacy has been demonstrated a number of times (Anderson, Hiebert, Scott, & Wilkinson, 1985; Foorman et al., 1998; Juel, 2000; Torgesen et al., 1999; Vellutino et al., 1996; Williams, 1980).

The other side of this apparent ability-by-treatment interaction is that first graders who enter with middle-range literacy skills benefit from classrooms with ample opportunities to read trade books (Juel, 2000). In an investigation of 4,872 kindergarten children in 114 classrooms where reading curricula (informed by ongoing professional development) varied in the degree of teacher choice and in the degree to which phonological awareness was incorporated, less teacher choice and more explicit incorporation of phonological awareness was associated with less variability across teachers in letter knowledge and phonological awareness at the end of kindergarten and in reading achievement at the end of first grade (Foorman et al., 2001). More teacher choice and a moderate number of phonological-awareness activities (mostly in the form of letter-sound instruction) were associated with more outliers—high-scoring children—at the end of kindergarten and first grade.

The effects of instruction can persist beyond the first grade, and they can be manifest in spelling as well as reading. Bruck, Triceman, Caravolos, Genese, and Cassar (1998) compared spelling in third-grade children who had whole-language instruction throughout school and third graders who instead had received phonics instruction. The phonics-instructed children were better spellers, and their spelling of pseudowords included more conventional, phonologically accurate patterns.

In general, it appears that the clarity and organization of research-based components in the curriculum make a difference to reading outcomes. However, out-of-the-box implementations of basal reading programs are not likely to be effective. Again, ongoing professional development that provides the rationale for each component of reading (and spelling) instruction and provides classroom coaching to deal with the pacing of instruction, classroom management, and grouping of students is what helps teachers develop successful readers. Expecting teachers to put aside their basal readers and create their own curricula is not realistic given the lack of resources and of the knowledge base to do so (Moats, 1994).

Summary

Since the 1960s, classroom studies of reading methods have consistently shown better results for early phonics instruction compared with instruction emphasizing meaning at the level of words and sentences. This effect is particularly strong for children at risk for reading failure because of lack of home literacy or weak phonological-awareness skills (children who have attention problems, chronic ear infections, articulation problems, or a history of dyslexia in their families). This interaction between children’s characteristics and curricular focus is moderated by instructional factors such as teachers’ knowledge and competency. Thus, the kinds of materials (curriculum) and instructional strategies used interact with a child’s stage of reading development in determining the child’s success in learning to read. This fact has important policy implications for improving literacy levels nationwide. Yet in the national arena, reading methods have become highly politicized, and the Great Debate has turned into the reading wars. Proponents of literature-based instruction (Coles, 2000; B. M. Taylor, Andersen, Au, & Raphael, 2000; D. Taylor, 1998) have attacked research supporting skills-based instruction, despite the fact that this research investigates processes fundamental to learning to read rather than skills-based instruction per se. In return, skills-based researchers have pointed out how these attacks have misrepresented the research and are based primarily on philosophical objections (Foorman, Fletcher, Francis, & Schatschneider, 2000; Mathes & Torgesen, 2000). Despite the controversy, there is no question that continued scientific study of what constitutes effective
SUMMARY AND CONCLUSIONS

In this monograph, we discussed a wide range of topics relevant to how children learn to read. We discussed evidence from developmental psychology concerning both the characteristics of children's language competency when they enter school and the nature of early reading development. We also discussed research on skilled reading (from cognitive psychology, cognitive neuroscience, and connectionist modeling) and the implications of this work for learning to read and teaching methods. Included in our discussion were arguments based on linguistic analyses, data from studies of skilled reading and brain activity during reading, and implications that follow from the implementation of connectionist models. Finally, we presented evidence from laboratory and classroom studies regarding the most effective methods for teaching reading.

From all these different perspectives, two inescapable conclusions emerge. The first is that mastering the alphabetic principle is essential to becoming proficient in the skill of reading, and the second is that instructional techniques (namely, phonics) that teach this principle directly are more effective than those that do not. This seems to be especially the case for children who are at risk in some way for having difficulty learning to read. It is also the case that the absence of instruction in phonics may increase the number of children at risk for becoming poor spellers (particularly because whole-language instruction often tolerates incorrect spellings). We do not deny the value inherent in various principles of whole-language teaching methods. As we noted many times throughout this monograph, instructional techniques that move beyond phonics practice to ensure the application of alphabetic principles to reading clearly support the process of learning to read. We also emphasized that the child's learning is every bit as important as the teacher's instruction. Obviously, using whole-language activities to supplement phonics instruction helps make reading fun and meaningful for children. Such activities may be most beneficial to children from environments where reading is not highly valued. But, at the end of the day, phonics instruction is critically important because it does help the beginning reader understand the alphabetic principle and apply it to reading and writing. Thus, the empirical data clearly indicate that elementary teachers who make the alphabetic principle explicit are most effective in helping their students become skilled, independent readers.

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