*Teaching Reading **Is** Rocket Science*

What Expert Teachers of Reading Should Know and Be Able To Do

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Should Know and Be Able To Do

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Table of Contents

Teaching reading is a job for an expert.

Preface

Reading is the fundamental skill upon which all formal education depends. Research now shows that a child who doesn't learn the reading basics early is unlikely to learn them at all. Any child who doesn't learn to read early and well will not easily master other skills and knowledge, and is unlikely to ever flourish in school or in life.

Low reading achievement, more than any other factor, is the root cause of chronically low-performing schools, which harm students and contribute to the loss of public confidence in our school system. When many children don't learn to read, the public schools cannot and will not be regarded as successful—and efforts to dismantle them will proceed.

Thanks to new scientific research—plus a long-awaited scientific and political consensus around this research—the knowledge exists to teach all but a handful of severely disabled children to read well. This report discusses the current state of teacher preparation in reading in relation to that research. It reviews and describes the knowledge base and essential skills that teacher candidates and practicing teachers must master if they are to be successful in teaching all children to read well. Finally, the report makes recommendations for improving the system of teacher education and professional development.

In medicine, if research found new ways to save lives, health care professionals would adopt these methods as quickly as possible, and would change practices, procedures, and systems. Educational research has found new ways to save young minds by helping them to become proficient readers; it is up to us to promote these new methods throughout the education system. Young lives depend on it. And so does the survival of public education. The urgent task before us is for university faculty and the teaching community to work together to develop programs that can help assure that all teachers of reading have access to this knowledge.

To understand printed language well enough to teach it explicitly requires disciplined study of its systems and forms, both spoken and written.

Executive Summary

The most fundamental responsibility of schools is teaching students to read. Indeed, the future success of all students hinges upon their ability to become proficient readers. Recent scientific studies have allowed us to understand more than ever before how literacy develops, why some children have difficulty, and what constitutes best instructional practice. Scientists now estimate that fully 95 percent of all children can be taught to read. Yet, in spite of all our knowledge, statistics reveal an alarming prevalence of struggling and poor readers that is not limited to any one segment of society:

- About 20 percent of elementary students nationwide have significant problems learning to read.
- At least 20 percent of elementary students do not read fluently enough to enjoy or engage in independent reading.
- The rate of reading failure for African-American, Hispanic, limited-English speakers and poor children ranges from 60 percent to 70 percent.
- One-third of poor readers nationwide are from college-educated families.
- Twenty-five percent of adults in this country lack the basic literacy skills required in a typical job.

Research indicates that, although some children will learn to read in spite of incidental teaching, others never learn unless they are taught in an organized, systematic, efficient way by a knowledgeable teacher using a well-designed instructional approach. And, while many students from high-risk environments come to school less prepared for literacy than their more advantaged peers, their risk of reading difficulties could still be prevented and ameliorated by literacy instruction that includes a range of research-based components and practices. But, as the statistics testify, this type of instruction clearly has not made its way into every classroom.

Indeed, a chasm exists between classroom instructional practices and the research knowledge-base on literacy development. Part of the responsibility for this divide lies with teacher preparation programs, many of which, for a variety of reasons, have failed to adequately prepare their teacher candidates to teach reading. Fortunately, this situation is being corrected, thanks in large part to recent basic research on reading that has allowed the community of reading scientists and educators to agree on what needs to be done. This new information about language, reading, and writing is just beginning to shape teacher preparation and instructional programs. This knowledge must also form the basis of high-quality professional development for practicing teachers.

What Does the Research Say About Effective Reading Instruction?

Well-designed, controlled comparisons of instructional approaches have consistently supported these components and practices in reading instruction:

- Direct teaching of decoding, comprehension, and literature appreciation;
- Phoneme awareness instruction;
- Systematic and explicit instruction in the code system of written English;
- Daily exposure to a variety of texts, as well as incentives for children to read

independently and with others;

- Vocabulary instruction that includes a variety of complementary methods designed to explore the relationships among words and the relationships among word structure, origin, and meaning;
- Comprehension strategies that include prediction of outcomes, summarizing, clarification, questioning, and visualization; and
- Frequent writing of prose to enable a deeper understanding of what is read.

Toward a Curriculum for Teacher Preparation and Inservice Professional Development

Because classroom instruction, more than any other factor, is crucial in preventing reading problems, it is a primary focus for effecting change. A comprehensive redesign of teacher preparation in reading instruction, founded on a core curriculum that defines the knowledge and skills necessary for effective practice, is vital to improved classroom instruction.

Such a research-based core curriculum would provide much more extensive, demanding, and content-driven training to inform classroom practice. Specifically, a core curriculum for teacher preparation must include components for:

- Understanding reading psychology and development;
- Understanding the structure of the English language;
- Applying best practices in all aspects of reading instruction; and
- Using validated, reliable, efficient assessments to inform classroom teaching.

This core curriculum can also serve as the basis for inservice professional development for the vast number of current teachers who have not been exposed to the research-based knowledge.

Changing Teacher Preparation and Professional Development in Reading

If higher standards and substantive courses of preparation are adopted now, the two million new teachers projected over the next decade may be equipped to minimize reading failure in all but a small percentage of students. To achieve that goal, a range of initiatives needs to be considered:

- Research should guide the profession.
- Core requirements and standards for new teachers should be established.
- Teacher education programs should be aligned with standards for students and licensing requirements for teachers.
- Professional development institutes should be created for professors of education and master teachers.
- Developers of textbooks and instructional materials should be encouraged to improve their products.
- High-quality professional development must be available for teachers.
- An investment in teaching should be made to attract and retain high-caliber teacher candidates.

The fact that teachers need better training to carry out deliberate instruction in reading, spelling, and writing should prompt action rather than criticism. It should highlight the existing gap between what teachers need and what they have been given. It should underscore the obligation of teacher preparation programs to provide candidates with a rigorous, research-based curriculum and opportunities to practice a range of predefined skills and knowledge, as well as the need for licensing authorities to assess that knowledge.

The knowledge and skills inherent in effective reading programs must be part of every teacher's reading instruction repertoire. Good, research-based teacher preparation programs, coupled with high-quality professional development for classroom teachers, can assure that this is so.

Preventing Reading Failure: A Top Priority for Education

In today's literate world, academic success, secure employment, and personal autonomy depend on reading and writing proficiency. All children who are capable of reading must be taught how to read; such is the fundamental responsibility of schooling. Although educators have long understood the importance of literacy, a series of recent studies goes a long way in elucidating the chain of cause and effect that supports the development of literacy. Convergent findings of high-quality research have clarified how children learn to read and what must be done to ensure that they do. Beyond doubt, reading early links one benefit to another. Enjoyment of reading, exposure to the language in books, and attainment of knowledge about the world all accrue in greater measure to those who have learned how to read before the end of first grade. Difficulty with the first steps of reading, in contrast, eventually undermines vocabulary growth, knowledge of the world, mastery of language, and skill in writing. Once behind in reading, few children catch up unless they receive intensive, individual, and expert instruction, a scarce (and expensive) commodity in most schools.[1]

Far too many children have trouble reading and writing. About 20 percent of elementary students nationwide have significant problems learning to read; at least another 20 percent do not read fluently enough to enjoy or engage in independent reading. Thus it should not be surprising that, according to the United States Office of Technology, 25 percent of the adult population lacks the basic literacy skills required in a typical job.[2] Among those who do not make it in life—school dropouts, incarcerated individuals, unemployed and underemployed adults—are high percentages of people who cannot read.[3] Such realities have prompted the National Institutes of Health to regard reading development and reading difficulty as a major public health concern.

For poor, minority children who attend low-performing urban schools, the incidence of reading failure is astronomical and completely unacceptable. African-American, Hispanic, limited-English speaking students, and those from impoverished homes fall behind and stay behind in far greater proportion than their white, middle-class counterparts. The rate of reading failure in these groups is 60 percent to 70 percent according to the National Assessment of Educational Progress.[4] This figure alone explains much about the poor academic achievement of minority students and why they are under-represented in professions that depend on higher education.

Environment, however, does not explain all. Many children from more advantaged, literacy-rich environments have trouble learning to read, and many children from high-risk environments do indeed learn to read.[5] California recently initiated a series of laws to reform reading education after 49 percent of students of college-educated parents scored "below basic" on the National Assessment of Educational Progress. One-third of poor readers nationwide are from college-educated families who presumably encourage literacy in the home.

The tragedy here is that most reading failure is unnecessary. We now know that classroom teaching itself, when it includes a range of research-based components and practices, can prevent and ameliorate reading difficulty. Although home factors do influence how well and how soon stu-

Learning to read is not natural or easy for most children. Reading is an acquired skill.

dents read, informed classroom instruction that targets specific language and reading skills beginning in kindergarten enhances success for all but a few students with moderate or severe learning disabilities. Scientists now estimate that 95 percent of all children can be taught to read at a level constrained only by their reasoning and listening comprehension abilities.[6] It is clear that students in high-risk populations need not fail at the rate they do.[7] When placed into schools with effective principals and well-prepared and well-supported teachers, African-American, Hispanic, or students who are economically disadvantaged can learn to read as well as their more advantaged peers.[8] Further, students who lack the prerequisite awareness of sounds, symbols, and word meanings can overcome their initial disadvantage if teachers incorporate critical skills into lessons directly, systematically, and actively.[9] Thus, while parents, tutors, and the community can contribute to reading success, classroom instruction must be viewed as the critical factor in preventing reading problems and must be the primary focus for change. Ensuring effective classroom instructional practice is well within the purview of educational policymakers.

Where We Are: Taking Stock of Teacher Preparation in Reading

The Difficulty of Teaching Reading Has Been Underestimated

Teaching reading is a job for an expert. Contrary to the popular theory that learning to read is natural and easy, learning to read is a complex linguistic achievement. For many children, it requires effort and incremental skill development. Moreover, teaching reading requires considerable knowledge and skill, acquired over several years through focused study and supervised practice.

Consider what the classroom demands of the teacher. Children's interest in reading must be stimulated through regular exposure to interesting books and through discussions in which students respond to many kinds of texts. For best results, the teacher must instruct most students directly, systematically, and explicitly to decipher words in print, all the while keeping in mind the ultimate purpose of reading, which is to learn, enjoy, and understand. To accommodate children's variability, the teacher must assess children and tailor lessons to individuals. She must interpret errors, give corrective feedback, select examples to illustrate concepts, explain new ideas in several ways, and connect linguistic symbols with "real" reading and writing. No one can develop such expertise by taking one or two college courses, or attending a few one-shot inservice workshops.

Although reading is the cornerstone of academic success, a single course in reading methods is often all that is offered most prospective teachers. Even if well taught, a single course is only the beginning. Without deeper knowledge, the specific techniques of lesson delivery cannot be acquired, let alone knowledge of language, reading psychology, children's literature, or the management of a reading program based on assessment. The demands of competent reading instruction, and the training experiences necessary to learn it, have been seriously underestimated by universities and by those who have approved licensing programs. The consequences for teachers and students alike have been disastrous.

Why Have Teachers Been Left Unprepared?

Why are the stringent demands of teaching reading and writing unrecognized in the design of preparation programs? In reading, at least, misunderstanding and lack of knowledge may play as big a role as institutional politics and budgetary constraints. What drives the mind of the reader is neither self-evident nor easy to grasp, and, consequently, many years of scientific inquiry have been necessary to expose the mechanisms of reading acquisition. Only recently has basic research allowed the community of reading scientists and educators to agree on what needs to be done. This new information about language, reading, and writing is just beginning to shape teacher preparation and instructional programs. This knowledge must also form the basis of inservice professional development for practicing teachers.

The Knowledge Base for Teaching Reading Is Hidden, Extensive, and Complex

Reading education is a field more vulnerable than many to faddish practices that

later prove to be untenable. Such is the risk whenever a human trait that becomes the subject of education is poorly understood. To appreciate why reading is one of psychology's more mysterious phenomena, we must consider the nature of the linguistic communication that reading requires. Skilled reading happens too fast and is too automatic to detect its underlying processes through simple introspection. We read, but we cannot watch how our minds make sense out of print. The linkage of sounds and symbols occurs rapidly and unconsciously. The linguistic units that compose words, the single speech sounds (phonemes), syllables, and meaningful parts (morphemes), are automatically matched with writing symbols so that attention is available for comprehension.[10] Because our attention is on meaning, we are not aware of the code translation process by which meaning is conveyed. Until we are faced with a class of children who are learning how to read symbols that represent speech sounds and word parts, we may never have analyzed language at the level required for explaining and teaching it. Similarly, we may not know how a paragraph is organized or how a story is put together until we teach writing to students who do not know how to organize their thoughts. Thus, to understand printed language well enough to teach it explicitly requires disciplined study of its systems and forms, both spoken and written.

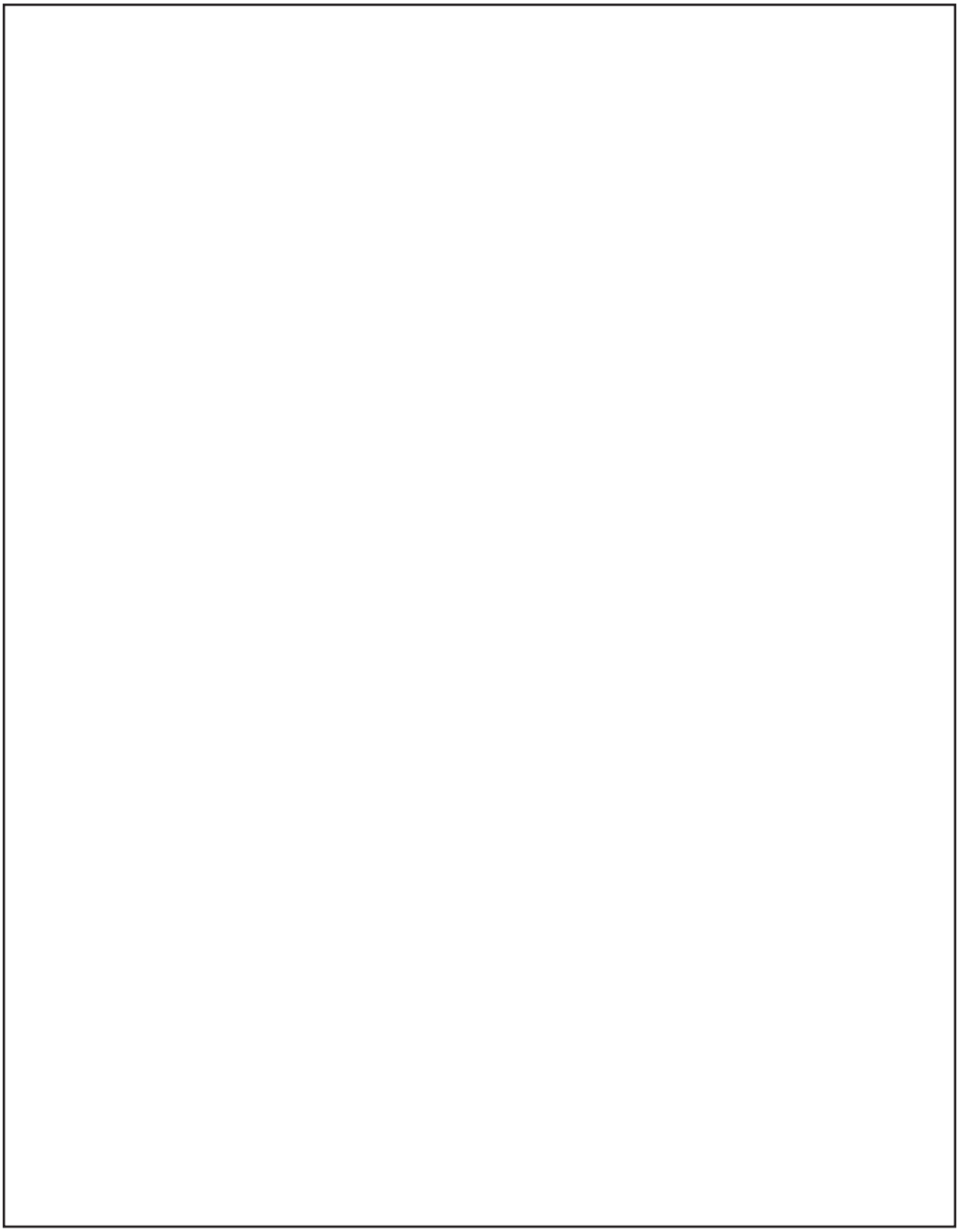
When adults are evaluated on knowledge of language, even those who are educated exhibit rudimentary or cursory familiarity with concepts about our writing system that are insufficient for teaching children. Surveys measuring experienced teachers' ability to identify speech sounds, spelling patterns, and word structures reveal confusions that are typical of most adults.[11] For example, the concept that a letter combination can represent one unique speech sound (*ch, wh, sh, th, ng*)—is unclear to a surprising number of elementary teachers. Many identify these units by rote but are unable to differentiate conceptually between these spelling units (digraphs) and two letters that stand for two distinct sounds (consonant blends such as *cl, st, pr*) or silent letter spellings that retain the sound of one consonant (*kn-, wr-, -mb*). Few adults can explain common spelling patterns that correspond to pronunciation and word meaning, such as why we double the consonant letters in words like *misspell*, *dinner*, and *accommodate*. A deeper, explicit level of knowledge may not be necessary to read the words, but it is necessary to explain pronunciation and spelling, where the words came from, and how spelling is related to meaning.[12]

Some children learn language concepts and their application very easily in spite of incidental teaching, but others never learn unless they are taught in an organized, systematic, efficient way by a knowledgeable teacher using a well-designed instructional approach. Children of average ability might learn enough about reading to get by, but may not develop the appreciation for language structure that supports learning words from context, organization of the mental dictionary, comparing words, or precise use of language.[13] Yet teachers are seldom asked to study the language they teach or how its form carries its message.

In addition, teachers are not born knowing the relationships among the basic skills of reading and reading comprehension. They may see that children read poorly in the middle and upper grades, but may not understand that proficiency in basic reading skill must be taught before students will progress. Without instruction and practice, teachers are unlikely to develop the questioning techniques and discussion strategies that promote thoughtful reading by groups of children.[14]

Meaningful Professional Standards Are Absent

Other complex and demanding professions insist on much more stringent training and preparation than that required of teachers. Pilots, engineers, optometrists, and art therapists, for example, must learn concepts, facts, and skills to a prescribed level, must conduct their practice under supervision, and must pass rigorous entry



examinations that are standardized across the profession. Continuing education to stay abreast of proven best practices is mandated. The public interest is protected by professional governing boards that monitor the knowledge base and oversee the competence of these licensed professionals. We, the consumers of these professional services, should be able to trust that any person holding a license has demonstrated competence and is accountable to his or her professional board of governance.

No such rules or standards assure that teachers who instruct children in reading have mastered the relevant knowledge base and acquired the necessary skills. Even within large universities that prepare hundreds of teachers every year, there may be no curricular specifications or standards. What a teacher candidate learns depends on the professor he or she selects. What the professor teaches is determined solely by what the professor may know or believe. Courses in reading, which are typically limited to three credit

hours, are often taught by adjunct faculty who are accountable to no one.[15] Thus, preparation for teaching reading often is more grounded in ideology than evidence.[16] While the academic freedom that professors often invoke has a place in teacher education, its claim is not as absolute as it may be in the humanities.[17] Professional preparation programs have a responsibility to teach a defined body of knowledge, skills, and abilities that are based on the best research in the field. This is no less important in reading[18] than it is in medicine or the law.

Good Information Is Hard To Get

Few of today's popular textbooks for teacher preparation in reading contain information about the known relationships between linguistic awareness, word recognition ability, and reading comprehension. Few discuss in any useful detail how the English writing system represents speech. Basic concepts such as the differences between speech sounds and spellings, the fact that every syllable in English is organized around a vowel sound, and the existence of meaningful units (morphemes) in the Latin layer of English (about 60 percent of running text) are rarely explained. Few texts contain accurate information about the role of phonology in reading development, and few explain with depth, accuracy, or clarity why many children have trouble learning to read or what to do about it. Teachers are often given inaccurate and misleading information based on unsupported ideas. For example, in the recent past, one of the most common misconceptions has been that knowledge of the phonic system can be finessed with awareness of sentence structure and meaning.[19] Textbooks for teachers must attain a much higher standard of accuracy, currency, depth, clarity, and relevance if teachers are to be well-prepared to teach reading.[20]

Classroom Instructional Programs Are Uninformative

Inadequately prepared novice teachers often find themselves dependent on the information given in teachers' manuals to learn about spoken and written language concepts and to generate strategies for teaching students to read. Major classroom textbooks in language arts omit systematic teaching about speech sounds, the spelling system, or how to read words by sounding them out.[21] The most popular programs being used today are appropriately strong on literature, illustrations, cross-disciplinary thematic units, and motivational strategies for children, but very weak or simply wrong when it comes to the structure of English and how children actually learn to read the words on the page.[22] A recent review of major classroom reading programs shows that they continue to lack the content necessary to teach basic reading systematically and explicitly.[23]

Can We Do Better?

Comprehensive redesign of teacher preparation and inservice professional development is possible, but it must begin with a definition of the knowledge and skills necessary for effective practice and demonstration of how these are best learned. Fortunately, leaders in the field—including the National Research Council panel on the Prevention of Reading Difficulties in Young Children and the member organizations of the Learning First Alliance—have reached consensus regarding the agenda for change.[24] They agree that new teachers require much more extensive, demanding, and content-driven training if discoveries from the reading sciences are to inform classroom practice.

Specifically, teachers must understand the basic psychological processes in reading, how children develop reading skill, how good readers differ from poor readers, how the English language is structured in spoken and written form, and the validated principles of effective reading instruction. The ability to design and deliver lessons to academically diverse learners, to select validated instructional methods and materials, and use assessments to tailor instruction are all central to effective teaching.

Only recently has basic research allowed the community of reading scientists and educators to agree on what needs to be done.

Toward a Curriculum for Teacher Preparation and Inservice Professional Development

A core curriculum for teacher preparation and inservice professional development can be divided roughly into the following four areas:

- Understanding knowledge of reading psychology and development;
- Understanding knowledge of language structure which is the content of instruction;
- Applying best practices in all aspects of reading instruction; and
- Using validated, reliable, efficient assessments to inform classroom teaching.

This core will, of course, be supplemented and honed in time, but its goal is to bring continuity, consistency, and comprehensiveness to preservice teacher education and to focus the content of continuing education and graduate programs. (For specific details on the curriculum content in these four areas see *Appendix A*.)

Knowledge of the Psychology of Reading and Reading Development

Basic Facts About Reading

If the findings of research psychologists, educators, and linguists were better known, the risk of unfounded and even harmful teaching practices would be reduced. Learning to read is not natural or easy for most children. Reading is an acquired skill, unlike spoken language, which is learned with almost any kind of contextual exposure. If learning to read were as natural as acquiring spoken language, many more societies would have written languages; human beings would have invented writing systems many thousands of years before we did; and everyone would learn reading as easily as ducks learn to swim. The prolonged, gradual, and predictable progression of skill in print translation attests to the difference between processing spoken and written language. Although surrounding children with books will enhance reading development, a "literature-rich environment" is not sufficient for learning to read. Neither will exposure to print ordinarily be sufficient for learning to spell, unless organized practice is provided. Thus, teachers must be reflective and knowledgeable about the content they are teaching, that is, the symbol system itself and its relationship to meaning.

Research has shown that good readers do not skim and sample the text when they scan a line in a book.[25] They process the letters of each word in detail, although they do so very rapidly and unconsciously. Those who comprehend well accomplish letter-wise text scanning with relative ease and fluency. When word identification is fast and accurate, a reader has ample mental energy to think over the meaning of the text. Knowledge of sound-symbol mapping is crucial in developing word recognition: the ability to sound out and recognize words accounts for about 80 percent of the variance in first-grade reading comprehension and continues to be a major (albeit diminishing) factor in text comprehension as students progress through the grades.[26]

The ability to sound out words is, in fact, a major underpinning that allows rapid recognition of words "by sight."

Language knowledge and language proficiency differentiate good and poor readers.

Before children can easily sound out or decode words, they must have at least an implicit awareness of the speech sounds that are represented by symbolic units (letters and their combinations). Children who learn to read well are sensitive to linguistic structure; recognize redundant patterns; and connect letter patterns with sounds, syllables, and meaningful word parts quickly, accurately, and unconsciously.[27] Effective teaching of reading entails these concepts, presented in an order in which children can learn them.

The Characteristics of Poor and Novice Readers

Experts agree that reading and writing call primarily on deep linguistic processing, not on more peripheral auditory or visual perceptual skills. Language knowledge and language proficiency differentiate good and poor readers. As they begin to learn, poor readers are not less intelligent or less motivated; they are, however, less skilled with language, especially at the level of elemental linguistic units smaller than whole words. For this reason, they benefit from instruction that develops awareness of sounds, syllables, meaningful word parts, relationships among word meanings, and the structures of written text.

The language skills that most reliably distinguish good and poor readers are specific to the phonological or speech-sound processing system. Those skills include awareness of linguistic units that lie within a word (consonants, vowels, syllables, grammatical endings, meaningful parts, and the spelling units that represent them) and fluency in recognition and recall of letters and spelling patterns that make up words. Thus, skilled reading presents a paradox: Those who can most easily make sense of text are also those who can most easily read nonsense. For example, children who comprehend well when they read also do better at tasks such as reading words taken out of context, sounding out novel words, and spelling nonsense words.[28] Intelligence and verbal reasoning ability do not predict reading success in the beginning stages as well as these specific linguistic skills.

Although the purpose of reading is to comprehend text, teachers should also appreciate the relationships among reading components in order to teach all components well—in connection to one another and with the emphasis needed at each stage of development.[29] A child cannot understand what he cannot decode, but what he decodes is meaningless unless he can understand it. If this relationship is realized, a teacher will teach linguistic awareness and phonics deliberately, while linking skills to context as much as possible.[30] When appropriate, the emphasis will shift to increasing reading volume and teaching the interpretive strategies central to comprehension: summarizing, questioning, predicting outcomes, and monitoring one's own understanding. But a focus on comprehension skills can—and should—begin long before children can decode. Teachers and other adults should read to children and, thereby, begin to develop their appreciation for the written word and their comprehension skills.

How Reading and Spelling Develop

Longitudinal studies of reading and spelling development have shown that students who read well in high school

learned early to sound words out and read new words with ease.[31] That is, they gained the insight that letters in our writing system more or less represent segments of speech (phonemes) and used this knowledge to increase their reading vocabularies. Moreover, emergent reading follows a predictable course regardless of the speed of reading acquisition.[32] The learner progresses from global to analytic processing, from approximate to specific linking of sound with symbols, and from context-driven to print-driven reading as proficiency is acquired. Awareness of letter sequences, speech sounds, and meanings of words develop in a reciprocal fashion as soon as basic phonological awareness and letter knowledge are gained. Effective teachers will recognize where their students are in reading and writing development and will tailor instruction accordingly.

The signs of each stage are readily apparent to a teacher who is a trained observer. Beginning students do not understand that letters represent the sounds in words, although they do know that print represents spoken messages. Next, they use their knowledge of letters and rudimentary awareness of speech sounds to attempt spelling and reading by sounding out parts of words, often the prominent consonants of a word (as in KR for *car* and HP for *happy*). Skill at sounding out words and at spelling them phonetically unfolds gradually as the child becomes aware of all the speech sounds in a word to which letters need to be matched. With appropriate instruction, children learn quickly how print patterns represent speech. For example, they know that *-ck* is used at the ends of words, that letters can be doubled at the ends of words but not at the beginnings, and that words typically contain a vowel sound. They learn in phases that *-ed* spells the past tense but is pronounced three different ways: /*t*/ as in *raked*, /*d*/ as in *played* and /*ed*/ as in *painted*. More advanced students will decipher words such as *synchronous* by larger chunks, reading by analogy to known words with the prefix *syn-*, the root *-chron*, and the suffix *-ous*.

Effective teaching, matched to the students' developmental levels, requires knowledge of word structure so that print conventions can be explained, identified, classified, and used for the higher purposes of efficient word recognition and vocabulary development. The methods of any lesson will be chosen according to the learner's level of skill development. Teaching children about sounds is appropriate at the very early stages; emphasizing morphemes is appropriate later on. At every level, teachers need to connect the teaching of these skills with the joy of reading and writing, using read-alouds and the motivating activities popularized by the whole-language movement. Expert teachers will have the knowledge, strategies, and materials to judge what to do with particular children, not on the basis of ideology, but on the basis of observation, logic, knowledge of child development, knowledge of content, and evidence for what works.

Teachers who understand the psychology of reading and reading development can answer questions like these:

Why is it useful to know if a student can read nonsense words such as *flep*, *tridding*, and *pertollic*?
The ability to read nonsense words depends on rapid and accurate association of sounds with symbols. Good readers do this easily so they can decipher new words and attend to the meaning of the passage. Poor readers usually are slower and make more mistakes in sounding out words. Their comprehension suffers as a consequence. Poor readers improve if they are taught in an organized, systematic manner how to decipher the spelling code and sound words out.

What does it mean if a 5-year-old child writes "pez tak me yet u?" (Please take me with you.)
This is early phonetic or letter name spelling, showing fairly well developed awareness of speech sounds (phonological awareness) but little knowledge of standard spelling. Over the next year, the child needs to be taught how to read and spell single consonants, short vowels, and regular word patterns with those elements, as well as a few high-frequency sight words at a time. Practice with decodable text is appropriate at this stage.

Which words do good readers skip as they read along at a good pace?
Almost none. Good readers process every letter of almost every word when they read.

Language: The Foundation for Reading Instruction

Expert teaching of reading requires knowledge of language structure at all levels. Without such knowledge, teachers are not able to respond insightfully to student errors, choose examples for concepts, explain and contrast words and their parts, or judge what focus is needed in a lesson. Suppose that the teacher wants the students to read and spell words such as *pin* and *pen*, *will* and *well, miss* and *mess* without confusing them? Lecturing or singing about short vowels is unlikely to prevent the errors children often make. Knowing that these vowels are similar in articulation might help the teacher emphasize how the vowels feel in the mouth when they are spoken. Anticipating the difficulty of these vowels, a teacher would provide frequent, short opportunities for students to contrast similar words and to read and spell words with /*ĭ*/ and /*ĕ*/ in the context of sentences and stories.

What if, in the middle grades, the word *deceive* is to be read, spelled, or understood? To help children who may not know the word or who may misread or misspell it, the teacher could draw upon the following information:

- *deceive* has two meaningful parts (morphemes), a prefix *de-* and a root *ceive-*;
- the word is a verb related to the nouns *deceit* and *deception*;
- the same root and derivational pattern can be found with *receive, conceive,* and *perceive*;
- the vowel spelling follows the "*i* before *e* except after *c*" spelling rule;
- the word ends with an *e* because no word in English ends in a plain *v* spelling for the /*v*/ sound;
- the /*s*/ phoneme is spelled with a *c* followed by *e;* and
- the accent of such Latin-based words is almost always on the root morpheme.

Armed with such information, accumulated over many lessons, the teacher can deepen students' word knowledge by calling their attention to any of these features in a lesson. The nature of exploration may vary from a "word a day" discussion, to finding *-ceive* words in a literature selection, to using several of the *-ceive* words in a written composition in their various forms (*receiving, reception, receptivity*).

Few teachers, however, are sufficiently well prepared to carry out such instruction—not through any fault of their own—but because their preparation programs, instructional materials, and teaching environments have not asked them to understand language with any depth or specificity. The language content that can inform instruction in reading and spelling is outlined in Part II of the core curriculum (see *Appendix A*). Chart 1, *Knowledge of Language Structure and Application To Teaching* illustrates the knowledge teachers must have and how that knowledge may be applied in teaching reading.

Teachers who understand the practical teaching skills in a comprehensive reading program can answer questions like these:

Can the words *shoe, do, flew,* and *you* be used for rhyming practice?

By all means. Rhyming should involve comparison and identification of spoken words that share a final vowel and consonant sound sequence. They do not have to be spelled the same way.

How fast should a second- or third-grader be able to read?

A minimum goal for oral reading fluency can be established by taking the child's age and multiplying by 10. A 7-year-old second-grader should be reading around 70 words per minute. By the end of third grade, children should read 100 words per minute in material at their independent reading level (at least 95 percent of words known).

When in the instructional sequence should a teacher ask a child to think about the meaning of the passage (context) to decipher a new word?

After the word has been decoded or pronounced, then context becomes useful in assigning meaning to the word or checking if the word *was read correctly. Guessing the word from context before trying to decode it is not advised.*

Practical Skills of Instruction in a Comprehensive Reading Program

Opportunities for Supervised Experience

Knowing what should be done in the classroom is necessary but not sufficient for developing practical teaching skills. Translating knowledge into practice requires experience with a range of students. New teachers seldom have the experience of watching various experts at work or receiving on-site supervision on a regular basis.[33] However, the repertoire of practical implementation skills to be learned is extensive, and the time needed to hone those skills is substantial. Internship programs should be designed to allow new teachers to collaborate with peers and with mentor teachers, and to support the development of skills new teachers need to manage the range of reading levels and instructional challenges they will encounter in their classrooms.

Use of Validated Instructional Practices

Children are routinely subjected to teaching practices that have not been tested and proven effective for children like themselves. Much more research must be undertaken to substantiate the value of a wide range of instructional approaches used in classrooms. Meanwhile, there is an increasing body of evidence that supports the effectiveness of several existing reading programs.[34] Experts agree that children who initially are at risk for failure are saved, in most cases, by instruction that teaches directly the specific language skills on which proficient reading depends. Effective teachers of reading raise awareness and proficiency with every level of language organization including sounds, syllables, meaningful parts (morphemes), phrases, sentences, paragraphs, and various genres of text. Teaching strategies are active, exploratory, and engaging. They also balance language skill instruction with its application to purposeful daily writing and reading, no matter what the skill level of the learner. Middle- and upper-grade children who are poor readers can be brought up to grade level with appropriate instruction although the time and effort involved is considerably greater than that required to teach younger children.[35]

Well-designed, controlled comparisons of instructional approaches have consistently supported these components and practices in reading instruction:[36]

Teachers who understand the knowledge of language structure and its application can answer questions like these:

What sounds will children confuse with /*p*/ and what can the teacher do to help children avoid confusion?
Sounds that are articulated similarly are most likely to be confused. The /*b*/ is articulated exactly like the /*p*/, except that it is voiced—the vocal cords get involved right away with /*b*/. Sometimes children confuse /*p*/, /*b*/, and /*m*/, again because they are all produced with the lips together. A teacher can point this out to children and then have them practice identifying, saying, reading, and spelling *these* sounds in contrasting words such as *bike*, *Mike*, and *pike*.

Why do children spell *dress* with a *j* or *g* in the beginning?
Because we pucker before the /*r*/ and make a sound more like /*j*/ or soft *g* than the /*d*/ in *desk*. Children can be asked to think about this and watch what their mouths do before practicing the recognition and spelling of *tr* (and *dr*) words.

Are *love, dove,* and *give* "exception" words in English?
No, they are completely predictable. English doesn't permit its written words to end in one *v* letter alone. The *e* is necessary to keep it company and prevent the word from ending in a *v*. These words can be taught as a group that does follow a pattern.

How many meaningful parts (morphemes) are there in the word *contracted*?
Three. The prefix *com*, meaning *with*, that was changed to *con* so that it would match up with the *t* for easier pronunciation; the root *tract* meaning *to pull,* and the past tense *ed. Contract* should be grouped with *retract, intractable, traction,* and other words that share its root.

Chart 1
Knowledge of Language Structure and Application To Teaching

LANGUAGE STRUCTURE	Domain of Teacher Knowledge	Teacher Skill or Ability: Examples of Application in Practice
Phonetics	Speech sounds are not letters. Consonant and vowel phoneme classes have special properties. Phonemes can be described by place and manner of articulation. Phoneme classes are determined by the articulatory features of the sounds. There is a finite inventory of consonant phonemes (25) and vowel phonemes (15) in English that can becompared with phoneme inventories in other languages.	Recognize phoneme substitutions in students' speech, reading, and spelling. Produce speech sounds accurately during reading, vocabulary, and spelling instruction. Identify, match, and select appropriate examples of words containing specific phonemes. Select contrasting pairs of words that differ only in one phoneme, for the purpose of teaching speech sound awareness.
Phonology	Naturally produced speech sounds are sometimes difficult to classify. Speech sounds are folded into one another during normal speaking (co-articulation). Speech sounds are produced in various forms because of phonological rules and dialectical variation. Phonology encompasses all aspects of speech processing and production including stress placement and memory for new words. The English alphabetic writing system represents phonemes indirectly and with considerable variation.	Recognize and describe phonological errors in children's speaking, reading, and writing. Evaluate the complexity of any syllable (whether it contains clusters before and/or after a vowel). Choose examples of words for specific onset-rime units and phonemes. Give feedback to students with reference to articulation. Plan and teach implicit and explicit activities designed to enhance phoneme awareness, syllable awareness, and memory for pronunciation. Understand and follow a developmental continuum in phonological skills during instruction. Link phonological skill development to reading, writing, and meaningful use of language.
Morphology	Over half the running words in text are Latin and Greek derived. These words are made up of roots, prefixes, and suffixes. Morphemes are the smallest meaningful units. Morphemes and syllables differ. Morpheme structure can be transparent or obscure. Our spelling system preserves morphology. Derivational and inflectional morphemes differ in function, form, and effect.	Recognize morphemes in words. Choose morphologically related words to teach reading, vocabulary, and spelling. Select and/or design word study for intermediate and high school students organized around common morphological roots and derived word forms.

LANGUAGE STRUCTURE	Domain of Teacher Knowledge	Teacher Skill or Ability: Examples of Application in Practice
Orthography	The English alphabet is a recent development. Letters represent sounds but are not the same as sounds. English orthography is variable and complex but predictable. Certain frequent spellings are used for each of the consonant and vowel phonemes of English. Words can be grouped by their spelling units (digraphs, blends, silent letter combinations, teams, diphthongs, and six common syllable types). Spelling includes patterns and rules.	Choose examples of spelling correspondences, patterns, rules, and exceptions. Recognize and sort predictable and unpredictable words. Adopt and learn a systematic plan for teaching decoding and spelling. Link decoding and spelling instruction. Evaluate the design of instructional materials.
Semantics	Word meanings are learned in relation to other word meanings. Word knowledge may be superficial or deep. Words have semantic features. Meaning-making is personal. New words are learned through repeated exposure in context and more formal study. How new words are acquired.	Identify antonyms, synonyms, analogies, associative linkages; classes, properties, and examples of concepts; connotative and denotative meanings. Teach words in relation to other words and concepts. Select words that are central for understanding a text.
Syntax and Text Structure	Texts have structures that can be represented graphically and three-dimensionally (e.g., narrative structure, exposition such as compare/contrast structure; argumentation and description). Sentences have an underlying structure that can be manipulated. Cohesive devices include reference, parallel sentence structure, organization of paragraphs.	Use a visual coding strategy to portray the sructure of simple sentences and their elaboration. Analyze and construct common paragraph forms. Map and outline the logical flow of text of various kinds. Recognize a well written (“reader friendly”) text.

- Direct teaching of decoding, comprehension, and literature appreciation is necessary from the beginning; as students develop, the emphasis, content, pacing, and complexity of lessons will change.
- Phoneme awareness instruction, when linked to systematic decoding and spelling, is a key to preventing reading failure in children who come to school without these prerequisite skills.
- It is better to teach the code system of written English systematically and explicitly than it is to teach it randomly, indirectly, or incidentally?[37] The units for instruction (sound, syllable, morpheme, word) should vary according to students' reading and spelling skills.
- The most effective programs include daily exposure to a variety of texts as well as incentives for children to read independently and with others. Practices that build reading fluency include repeated readings of text, alternate reading with a partner, and simultaneous oral reading in easy material.
- Vocabulary is best taught with a variety of complementary methods designed to explore the relationships among words and the relationships among word structure, origin, and meaning.
- Key comprehension strategies include prediction of outcomes, summarizing, clarification, questioning, and visualization; these should be modeled explicitly by the teacher and practiced overtly if students are not comprehending well or if they approach reading comprehension passively.
- Effective teachers encourage frequent writing of prose to enable deeper understanding of what is read.

Part III (*Appendix A*) of the core curriculum outline includes the practical teaching skills that are necessary for each of the major components of effective classroom instruction.

Assessment of Classroom Reading and Writing Skills

Teachers also receive inadequate preparation in the selection and use of assessments to inform their practice. Rather than teaching teachers to use unreliable assessments of questionable validity, training should be focused on the use of measures and observation tools that have demonstrated usefulness for specific purposes. Assessments employed routinely by teachers should have been studied to determine their reliability and validity for prediction, grouping, comparison, or instruction that improves children's reading or writing. Part IV (*Appendix A*) of the core curriculum addresses teachers' knowledge and use of assessment.

Teachers who understand the assessment of classroom reading and writing skills can answer questions like these:

What specific skills present at the end of first grade best predict later reading achievement ?
The ability to give the sounds that letters represent, to name letters, and to complete simple phoneme awareness tasks such as initial consonant matching, sound blending, and sound segmentation.

Are running records or oral reading tests reliable or valid indicators of reading ability?
The reliability of oral reading tests and running records is lower than the reliability of more structured, specific measures of component reading skills. Teacher judgment of the cause of specific oral reading errors (e.g., miscue analysis) tends to be much less reliable.

When are children typically expected to spell these words?
Trapped, offered, plate, illustrate, preparing

Plate: end of first grade when the most common long vowel spelling is learned.

Trapped: end of second grade when the basic doubling rule for endings beginning with vowels is learned.

Preparing: end of fourth grade when students expand their knowledge to Latin-based words with prefixes, roots, and suffixes.

Illustrate: end of fifth grade when more complex words with prefix, root, and suffixes are learned.

Offered: end of sixth grade when patterns involve prefixes, roots and suffixes, and more complex spelling changes.

Why is it important to test comprehension with material the student has not read before?
Because if students have been previously exposed to a passage, they can answer questions without being able to truly read the passage.

Where We Need To Go: Changing Teacher Preparation and Professional Development in Reading

In the next 10 years, about two million new teachers will be hired. If higher standards and substantive courses of preparation are adopted now, American educators will be equipped to minimize reading failure in all but a small percentage of students. To achieve that goal, a range of initiatives needs to be considered.

1. Research Should Guide the Profession. Teacher educators must be conversant with the new research findings and incorporate them into their coursework in teacher preparation. Schools of education must collaborate with the liberal arts faculty to assure that the necessary knowledge about language and learning are accessible to teacher candidates.

Teachers must be educated to identify, read, respect, and apply the findings of scientific research to their practice. Although teachers typically mistrust the classroom practicability of much educational research and seldom have access to research reports,[38] their courses and inservice workshops should be liberally informed by exemplary studies. Practicum experiences should focus on methods shown to work with well-defined groups of learners. Teachers are often not in a position to make decisions regarding district reading curricula and/or reading texts. Nevertheless, teachers who understand the foundations of their discipline are better prepared to argue against the wholesale district adoption of irresponsible fads and market-driven changes in teaching philosophy.

If research guides their profession, teachers will be in a better position to countermand the proliferation of appealing but unsupported ideas that have been harmful influences for more than a decade.[39] Examples of popular misconceptions include:

- reading instruction is only needed until third grade;
- competent teachers do not use published reading programs;
- avoiding published reading programs empowers teachers and enhances the professional status of teaching;
- teaching phonics, word attack, and spelling skills directly to children is harmful;
- those who favor good code instruction are opposed to literature and comprehension instruction;
- reading a lot is the best way to overcome a reading problem;
- children should be taught to guess words on the basis of meaning and syntax;[40] and
- skills must always be taught in the context of literature.

With no accountability system to check their dissemination, unsupported ideas such as these fill the void left by weak preservice and inservice programs. Perhaps

the dubious quality of past educational research has justified the prevalent cynicism among educators, who are often told that research exists to support any point of view.[41] However, reading is actually one of the most studied aspects of human behavior, and a large body of work based on sound principles of objective inquiry exists that could be informing the field.[42] Indeed, our best reading studies test competing hypotheses with well-defined groups of children, employ designs that allow the studies to be replicated, and yield results obtained with methodological sophistication.[43] Independent peer review is part of the scientific process that attempts to control for the biases of investigators. Even our best studies will be flawed, however, and no single study will have all the answers we seek, so converging findings from multiple studies should drive the profession.

2. Establish Core Standards, Curriculum and Entry Level Assessments for New Teachers. Following the example of several states,[44] the knowledge and abilities important for competent delivery of balanced, comprehensive reading instruction must be defined. Such standards should form the basis of the reading curriculum for teacher candidates and should inform the assessments used for licensing. California's requirements, established by the Commission on Teacher Credentialing, are exemplary for preparing teachers because they focus on knowledge of language structure, the importance of aligning instruction with student characteristics, and the importance of skilled teaching behavior in domains validated by research. They form the basis for a Reading Instruction Competency Assessment now given to aspiring teachers.[45] It is significant to note that these requirements were developed by the profession, not mandated in state law. Some states have chosen to mandate specific coursework for teachers; others delineate competencies and allow schools of education to redesign programs to meet them. A core curriculum for preparing teachers of reading is needed to guide the assemblage of learning experiences offered to teachers across preparation programs. The core curriculum will, of course, change over time in response to new research and needs, but it should remain a stable center around which the profession evolves.

Although a sufficient body of research on reading instruction exists to guide practice, many more studies of preparation for teaching reading are needed. It would be useful to know both how much and what kind of practice helps a novice teacher become comfortable teaching the major components of a reading lesson. Is it best to start with a script from which the more seasoned teacher can depart? Is it best to begin with practical experience and then move to theory and research? Is the teacher's knowledge of language a measurable influence on student achievement? Should teachers begin by instructing only one student? What kind of observation is most helpful to a new teacher? Is there a sequence of coursework and experience that is most efficient and productive for learning what to do? Such questions merit systematic investigation if we are to dramatically improve teacher preparation in the long run.

3. Align Teacher Education Curricula, Standards for Students, and Licensing Requirements for Teachers. Teacher education schools should be accountable for the quality and effectiveness of their programs. For too long, universities have underinvested in income-producing programs, such as teacher education, without concern for the preparedness of their graduates. States, under pressure to bring more adults into the teaching profession, have been reluctant to impose stringent criteria for preparedness. The expectations for teacher candidates are often low within schools of education where clear standards derived from objective measurement have not been upheld. Professors in education programs, who are usually paid less than other academics in higher education, have a heavy teaching load and few incentives for spending time with teachers in schools. Collaborative partnerships between schools and universities are weak or nonexistent, so that there is often no alignment between what teachers learn in school and what

they must teach once they are in the classroom. Consistency among university core curricula for teachers, state standards and curriculum frameworks for school children, and teacher licensing standards could eliminate the confusing and contradictory learning experiences that teachers now encounter.

4. Create Professional Development Institutes for Professors and Master Teachers. Are professors of education currently able to provide instruction in the core curriculum suggested in this paper? A recent survey of the reading educator faculty in California indicates that they are not. Indeed, a review of reading course syllabi by California's Commission on Teacher Credentialing noted important gaps in substance.[46] The review suggests that deep, substantive changes are needed in course content and design. Individual professors often do commendable work under adverse circumstances, but many are not familiar with the basic disciplines that might inform reading education and are insulated from scientific progress in fields that have an impact on their own. Professors and staff developers deserve opportunities and incentives to attend professional development institutes to keep abreast of advances in fields such as linguistics, neuropsychology, developmental psychology, cognitive experimental psychology, and multidisciplinary intervention research.[47]

5. Press the Developers of Textbooks and Instructional Materials To Improve Their Products. Textbooks must eventually be held to a standard of comprehensiveness, accuracy, logic, research validation, and manageability before being allowed onto state or school district adoption lists. Just as the public is protected from untested drugs, unsafe manufactured goods, and unhealthy environmental pollutants, so should school children and teachers be protected from the widespread implementation of untested or ineffective programs and materials. Enormous amounts of money are spent yearly by schools on vendors' products, most of which are totally lacking in demonstrated efficacy. Districts and teachers should analyze texts against what is known about reading instruction. Only reading programs that incorporate practices and materials validated by research should be adopted for general use.

6. Promote High-Quality Professional Development for Teachers. Every teacher who currently teaches reading would benefit from high-quality education about reading development, language structure, and recent research findings. Validated instructional programs should be accessible to every teacher, along with consultation and demonstration of their effective use. Teachers need ongoing professional development that has topical continuity, practical application, and opportunities for collaboration with peers. These professional development experiences should be linked to continuous in-class coaching. State boards can target the use of state monies to support those professional development programs that meet criteria for quality, currency, effectiveness, and alignment with achievement standards. The federal government can offer grants to stimulate working partnerships among research institutions, public schools, and teacher preparation programs. Time is too valuable to waste on the discontinuous, ineffective inservice programs still popular in our schools.

7. Invest in Teaching. Strong teacher candidates will enter and stay with the profession if their working conditions improve. First and foremost, candidates must be equipped to do the task at hand before they are put into classrooms to manage on their own. Amenities that many of us take for granted, such as access to telephones and copy machines, time to eat lunch or plan with colleagues, freedom from menial chores, assistance within the classroom, and access to validated instructional materials should be available to all teachers. Teachers who know they can achieve results because their programs and training have prepared them are likely to stay in the profession, experience a high degree of job satisfaction, and rebuild respect for public education.

In Sum

The fact that teachers need better training to carry out deliberate instruction in reading, spelling, and writing should prompt action rather than criticism. It should highlight the chronic gap between what teachers need and what they have been given. It should underscore the obligation of licensing programs to combine coursework with practice on a range of predefined skills and knowledge. The deficiencies in teacher preparation represent both a misunderstanding of what reading instruction demands and a mistaken notion that any literate person should be able to teach children to read. We do not expect that anyone who appreciates music can teach music appreciation, or that anyone who can balance a checkbook can teach math.

Just about all children can be taught to read and deserve no less from their teachers. Teachers, in turn, deserve no less than the knowledge, skills, and supported practice that will enable their teaching to succeed. There is no more important challenge for education to undertake.

End Notes

[1] Sources for these statistics include Cunningham and Stanovich, 1998; Fletcher et al., 1994; Fletcher and Lyon, 1998; Juel, 1988; Shaywitz et al., 1992; and estimates by the U.S. Office of Special Education Programs of referral rates for reading problems.

[2] United States Office of Technology Assessment, 1993.

[3] Cramer & Ellis, 1996.

[4] 1992 and 1994 data for fourth-graders reading below the basic level of proficiency required to do grade level work, National Assessment of Educational Progress.

[5] Scarborough & Dobrich, 1994.

[6] Fletcher & Lyon, 1998, summarize intervention studies that have been successful in reducing reading failure to this level.

[7] Nicholson, 1997.

[8] Ibid.

[9] Adams et al., 1998; Brady et al., 1994; Tangel & Blachman, 1995; Scanlon & Vellutino, 1997.

[10] A. Liberman (1997). In April 1998, Dr. Liberman received the Distinguished Lifetime Achievement Award from the Society for the Scientific Study of Reading for his work explicating the nature of phonological processing and its relationship to reading.

[11] Moats, 1995; Moats & Lyon, 1996; Scarborough et al., 1998.

[12] Shankweiler et al., 1996.

[13] Ibid.

[14] Beck et al., 1998; Pressley, 1998.

[15] Corroborated by the California Commission on Teacher Credentialing survey of reading courses in state universities in 1996.

[16] Stanovich, 1994.

[17] Report on the California State University Academic Senate's condemnation of the state legislature's reading initiative: "Some Professors Resist State's Reform Formula" by Duke Helfand. *Los Angeles Times,* Oct. 25, 1998.

[18] Summaries such as those by Adams, 1990; Pressley, 1998; Osborn & Lehr, 1998.

[19] M. Adams, 1998.

[20] Textbooks would need to be aligned with curriculum and content standards for teachers and research standards established by major consensus documents.

[21] In 1996, the California Department of Education surveyed major instructional programs on its adoption list before determining that special funding was necessary to support districts' purchase of supplementary instructional materials in these domains. (See note 46.)

[22] Stein, 1993.

[23] Stein, M., Johnson/Gutlon, unpublished manuscript.

[24] Snow, Burns, & Griffin, 1998; Learning First Alliance, 1998.

[25] Share & Stanovich, 1995; Adams, Treiman & Pressley, 1998.

[26] Foorman, et al., 1997.

[27] Adams, 1990; Adams, Treiman & Pressley, 1998; Share & Stanovich, 1995; Pressley, 1998.

[28] Fletcher & Lyon, 1998.

[29] Ibid.

[30] The appropriate context for beginning reading gives children ample practice with decodable text, books designed so that children can read many examples of words representing a phonic or spelling pattern (see Stein, 1993) and Stein, Johnson & Gutlon, 1998.

[31] This early achievement in reading is often referred to as mastering the alphabetic principle.

[32] Ehri, 1994; Pressley, 1998.

[33] Lyon, Vaasen, & Toomey, 1989.

[34] American Federation of Teachers, *Seven Promising Reading and English Arts Programs,* 1998.

[35] Torgesen, 1998.

[36] Snow, Burns, & Griffin, 1998.

[37] Tunmer & Hoover, 1993.

[38] Commeyras & DeGroff, 1998.

[39] Pressley, M. 1998, pp. 275-278, describes these and other "myths" in reading education.

[40] The idea of "three cueing systems" has encouraged teachers to teach children to guess at words from context as an alternative to sounding them out. The concept has little grounding in psychological science (Adams, 1998).

[41] Acknowledged in a resolution of Congress in which the Department of Education was instructed to improve its research standards and bring them in line with those of the National Institutes of Health.

[42] The National Reading Panel is charged with formalizing the criteria by which reading research should be judged and by which policy and practice should be informed.

[43] Lyon & Moats, 1997.

[44] The Reading Instruction Competency Assessment (RICA), under design since 1996, will be given to all credential candidates.

[45] Guidelines to the Reading Instruction Competency Assessment can be obtained from the California Commission on Teacher Credentialing.

[46] Resource Document Seven, An Analysis of Reading Courses and Reading-Related Courses in Elementary Teacher Education Programs, a report based on a survey by the Commission on Teacher Credentialing, California Department of Education, conducted in May 1996, and distributed in October 1996.

[47] Advanced institutes for instructional leadership in reading education might be established in our most prestigious universities and modeled after Harvard's summer institutes for school principals.

References

Adams, M. (1998). The three-cueing systems. In J. Osborn and F. Lehr (eds.), *Literacy for all: Issues in teaching and learning* (pp. 73-99). New York: Guilford Press.

Adams, M.J. (1990). *Beginning to read: Thinking and learning about print.* Cambridge, MA: MIT Press.

Adams, M.J., Foorman, B.R., Lundberg, I., & Beeler, T. (Spring/Summer 1998). The elusive phoneme. *American Educator,* 22, 18-29.

Adams, M.J., Treiman, R., & Pressley, M. (1998). Reading, writing, and literacy. In I.E. Sigel and K.A. Renninger (eds.), *Handbook of Child Psychology, Fifth Edition, Volume 4, Child Psychology in Practice* (pp. 275-355). New York: Wiley.

American Federation of Teachers (1998). *Seven Promising English and Language Arts Programs.* Washington, D.C.

Beck, I.L., McKeown, M.G., Hamilton, R.L., & Kucan, L. (Spring/Summer 1998). Getting at the meaning: How to help students unpack difficult text. *American Educator,* 22, 66-71, 85.

Blachman, B. (ed.) (1997). *Foundations of Reading Acquisition and Dyslexia: Implications for Early Intervention.* Mahwah, NJ: Lawrence Erlbaum.

Brady, S., Fowler, A., Stone, B., & Winbury, N. (1994). Training phonological awareness: A study with inner-city kindergarten children. *Annals of Dyslexia,* 44, 26-102.

Brown, I.S. & Felton, R.H. (1990). Effects of instruction on beginning reading skills in children at risk for reading disability. *Reading and Writing: An Interdisciplinary Journal,* 2, 223-241.

Commeyras, M. & DeGroff, L. (1998). Literacy professionals' perspectives on professional development and pedagogy: A United States survey. *Reading Research Quarterly,* 33, 434-472.

Cramer, S. & Ellis, W. (eds.) (1996). *Learning disabilities: Life-long issues.* Baltimore: Paul S. Brookes.

Cunningham, A.E. & Stanovich, K. (Spring/Summer 1998). What Reading Does for the Mind, *American Educator,* 22, 8-15.

Ehri, L. (1994). Development of the ability to read words: Update. In R. Ruddell, M. Ruddell, & H. Singer (eds.). *Theoretical models and processes of reading* (pp. 323-358). Newark, DE: International Reading Association.

Evers, W.M. (1998). *What's gone wrong in America's classrooms.* Stanford, CA: Hoover Institution Press.

Fletcher, J.M. & Lyon, G.R. (1998). Reading: A research-based approach. In W. Evers (ed.), *What's Gone Wrong in America's Classrooms?* Stanford CA: Hoover Institution Press.

Fletcher, J.M., Shaywitz, S.E., Shankweiler, D.P., Katz, L., Liberman, I.Y., Stuebing, K.K., Francis, D.J., Fowler, A.E., & Shaywitz, B.A. (1994). Cognitive profiles of reading disability: A longitudinal, individual growth curves analysis. *Journal of Educational Psychology,* 88, 3-17.

Foorman, B.R., Francis, D.J., Fletcher, J.M., Schatschneider, C., & Mehta, P. (1998). The role of instruction in learning to read: Preventing reading failure in at-risk children. *Journal of Educational Psychology,* 90, 1-15.

Foorman, B.R., Francis, D.J., Shaywitz, S.E., Shaywitz, B.A., & Fletcher, J.M. (1997). The case for early reading intervention. In B. Blachman (ed.), *Foundations of Reading Acquisition and Dyslexia* (pp. 243-264). Mahwah, NJ: Lawrence Erlbaum.

Francis, D.J., Shaywitz, S.E., Stuebing, K.K., Shaywitz, B.A., & Fletcher, J.M. (1996). Developmental lag versus deficit models of reading disability: A longitudinal, individual growth curves analysis. *Journal of Educational Psychology,* 88, 3-17.

Gaskins, I.W., Ehri, L.C., Cress, C., O'Hara, C., & Donnelly, K. (1996). Procedures for word learning: Making discoveries about words. *The Reading Teacher,* 50, 312-327.

Invernizzi, M., Rosemary, C., Juel, C., & Richards, H.C. (1997). At-risk readers and community volunteers: A 3-year perspective. *Scientific Studies of Reading,* 1, 277-300.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first

At every level, teachers need to connect the teaching of skills with the joy of reading and writing, using read-alouds and the motivating activities popularized by the whole-language movement.

through fourth grades. *Journal of Educational Psychology,* 80, 437-447.

Learning First Alliance (Spring/Summer 1998). Every child reading: An action plan of the Learning First Alliance, *American Educator,* 52-63.

Liberman, A. (1997). How theories of speech affect research in reading and writing. In B. Blachman (ed.), *Foundations of Reading Acquisition and Dyslexia* (pp. 3-20). Mahwah, NJ: Lawrence Erlbaum.

Lyon, G.R. & Moats, L.C. (1997). Critical conceptual and methodological considerations in reading intervention research. *Journal of Learning Disabilities,* 30, 578-588.

Lyon, G.R., Vaasen, M., & Toomey, F. (1989). Teachers' perceptions of their undergraduate and graduate preparation. *Teacher Education and Special Education,* 12, 164-169.

Moats, L.C. (Summer 1995). The missing foundation in teacher preparation. *American Educator,* 9, 43-51.

Moats, L.C. & Lyon, G.R. (1996). Wanted: Teachers with knowledge of language, *Topics in Language Disorders,* Vol. 16, 73-81.

National Assessment of Educational Progress (1995). 1994 NAEP—Reading: A First Look. Washington, D.C.: National Center for Education Statistics.

Nicholson, T. (1997). Closing the gap on reading failure: Social background, phonemic awareness, and learning to read. In B. Blachman (ed.), *Foundations of Reading Acquisition and Dyslexia.* (pp. 381-407). Mahwah, NJ: Lawrence Erlbaum.

Osborn, J. & Lehr, F. (eds.) (1998). *Literacy for all: Issues in teaching and learning.* New York: Guilford Press.

Patton, S. & Holmes, M. (eds.) (1998). *The keys to literacy.* Washington, D.C.: Council for Basic Education.

Pressley, M. (1998). *Reading instruction that works: The case for balanced teaching.* New York: Guilford Press.

Putnam, L. (ed.) (1996). *Readings on Language and Literacy: Essays in honor of Jeanne S. Chall.* Cambridge, MA: Brookline Books.

Scanlon, D. & Vellutino, F.R. (1997). A comparison of the instructional backgrounds and cognitive profiles of poor, average, and good readers who were initially identified as at risk for reading failure. *Scientific Studies of Reading,* 1, 191-215.

Scarborough, H.S. & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review,* 14, 245-302.

Scarborough, H.S., Ehri, L.C., Olson, R.K., & Fowler, A.E. (1998). The fate of phonemic awareness beyond the elementary school years. S*cientific Studies of Reading,* 2, 115-142.

Shankweiler, D., Lundquist, E., Dreyer, L.G., & Dickinson, C.C. (1996). Reading and spelling difficulties in high school students: Causes and consequences. *Reading and Writing: An Interdisciplinary Journal,* 8, 267-294.

Share, D. & Stanovich, K.E. (1995). Cognitive processes in early reading development: Accommodating individual differences into a mode of acquisition. *Issues in Education: Contributions from Educational Psychology,* 1, 1-57.

Shaywitz, S.E., Escobar, M.D., Shaywitz, B.A., Fletcher, J.M., & Makuch, R.W. (1992). Evidence that dyslexia may represent the lower tail of a normal distribution of reading ability. *New England Journal of Medicine,* 326, 145-150.

Snow, C., Burns, S., and Griffin, P. (eds.) (1998). *Preventing reading difficulties in young children.* Washington, D.C.: National Academy Press.

Stanovich, K.E. (1994). Romance and reality. *The Reading Teacher,* 47, 280-291.

Stanovich, K.E. & Siegel, L.S. (1994). The phenotypic profile of reading-disabled children: A regression-based test of the phonological-core variable difference model. *Journal of Educational Psychology,* 86, 24-53.

Stein, M.L. (1993). *The beginning reading instruction study.* Washington, D.C.: U.S. Government Printing Office.

Stein, M., Johnson, B., & Gutlohn, L. (unpublished). Analyzing beginning reading programs: The relationship between decoding instruction and text. (Distributed at the Virginia Reading Forum, Roanoke, VA, Nov. 3, 1998.)

Tangel, D. & Blachman, B. (1995). Effect of phoneme awareness instruction on the invented spelling of first-grade children: A one-year followup. *Journal of Reading Behavior,* 27, 153-185.

Torgesen, J.K. (Spring/Summer 1998). Catch them before they fall: Identification and assessment to prevent reading failure in young children. *American Educator,* 22, 32-39.

Tunmer, W.E. & Hoover, W.A. (1993). Phonological recoding skill and beginning reading. *Reading and Writing: An Interdisciplinary Journal,* 5, 161-179.

United States Office of Technology Assessment (1993). Adult literacy and new technologies. Washington, D.C.: U.S. Government Printing Office.

Appendix A

Knowledge and Skills for Teaching Reading: A Core Curriculum for Teacher Candidates

Part I. The Psychology of Reading and Reading Development

A. Cognitive Characteristics of Proficient Reading

1. Language proficiencies of good readers.
2. Eye movements and text scanning.
3. Active construction of meaning.
4. Flexibility and self-monitoring.

B. Cognitive Characteristics of Poor Reading

1. Variable language difficulties of poor readers.
2. Phonological processing, reading speed, and comprehension—their manifestations and interrelationships.
3. Non-linguistic factors in reading difficulty.
4. Alternative hypotheses about reading difficulty, supported and unsupported.

C. Environmental and Physiological Factors in Reading Development

1. Socioeconomic and environmental factors in reading.
2. Neurological studies of good and poor reading.
3. Familial factors in dyslexia.

D. The Development of Reading, Writing, and Spelling

1. Emergent literacy.
2. Early alphabetic reading and writing.
3. Later alphabetic reading and writing.
4. Orthographic knowledge at the within-word level.
5. Orthographic knowledge at the syllable juncture level.
6. Orthographic knowledge at the morphemic, derivational level.
7. The role of fluency in reading development.
8. The relationships between phonology, decoding, fluency, and comprehension.

Part II. Knowledge of Language Structure and Its Application

A. Phonetics

1. Classes of consonant and vowel speech sounds (phonemes) and the inventory of the phonemes in English.
2. Similarities and differences among groups of phonemes, by place and manner of articulation.
3. Differences between the inventory of speech sounds (40-44) and the inventory of letters (26); how letters are used to represent speech sounds.
4. The basis for speech sound confusions that affect reading and spelling.

B. Phonology

1. Components of phonological processing (articulation, pronunciation, phoneme awareness, word memory, and word retrieval).
2. Phoneme awareness:
   a. Why it is difficult.
   b. How it supports learning an alphabetic writing system.

c. How it develops.
3. Dialect and other language differences.

C. Morphology
1. Definition and identification of morphemes (the smallest units of meaning).
2. Grammatical endings (inflections) and prefixes, suffixes, and roots (derivational morphemes).
3. How English spelling represents morphemes.
4. The network of word relationships.

D. Orthography
1. Predictability and pattern in English spelling.
2. Historical roots and layers of orthographic representation.
3. Major spellings for each of the consonant and vowel phonemes of English.
4. Spelling conventions for syllable types.
5. Sequence of orthographic knowledge development.

E. Semantics
1. Depth, breadth, and specificity in knowledge of meaning.
2. Definition, connotation, denotation, semantic overlap.
3. Idiomatic and figurative language.
4. How new words are created.
5. Ways of knowing a word: antonyms, synonyms, analogies, associative linkages, classes, properties, and examples of concepts.

F. Syntax and Text Structure
1. Basic phrase structure.
2. Four types of sentences.
3. Sentence manipulations: expansion, rearrangement, paraphrase, negation, formation of interrogative and imperative.
4. Visual and diagrammatic ways to represent sentence structure.
5. Genres and their distinguishing features.
6. Reference and cohesive devices in text.
7. Graphic and three-dimensional representation of paragraph and text structure.

Part III. Practical Skills of Instruction in a Comprehensive Reading Program

A. Consensus Findings of Research
1. Recognize and implement components of successful, valid early intervention programs.
2. Cite and support components of validated remedial and tutorial programs.
3. Refer to validated components of middle school reading programs in designing instruction.
4. Employ proven principles of teaching reading in the content areas.

B. Concepts of Print, Letter Recognition, Phoneme Awareness
1. Select programs and lessons appropriate for students' instructional levels.
2. Give corrective feedback and design lessons based on students' needs, including their phonological and orthographic development.
3. Teach phonological and letter identification skills explicitly, sequentially, and systematically.
4. Link phonological skill development to reading, writing, and meaningful use of language.

C. Decoding, Word Attack
1. Use active, constructive approaches to teach word concepts.
2. Select programs and lessons appropriate for students' instructional levels.
3. Give corrective feedback and design lessons based on students' needs, including their phonological and orthographic development.
4. Teach decoding skills explicitly, sequentially, and systematically: sound-symbol association; sound-by-sound blending; reading onsets, rimes, syllables, morphemes; sight word recognition.
5. Select and use decodable text for reading practice in the early stages.
6. Link practice in word attack to reading, writing, and meaningful use of language.

D. Spelling

1. Match spelling instruction to students' developmental levels of word knowledge.
2. Follow a scope and sequence based on language organization and how students learn it.
3. Use multisensory techniques for sight word learning.
4. Teach active discovery of generalizations, rules, and patterns.
5. Practice spelling in writing and proofreading.

E. Fluency

1. Use repeated readings, alternate and choral reading, and self-timing strategies to provide practice.
2. Identify reading materials for students' independent reading levels.
3. Promote daily reading of varied text, in school and outside of school.

F. Vocabulary Development

1. Teach words together that are related in structure and/or meaning.
2. Select and/or design word study for intermediate and high school students organized around common morphological roots and derived word forms.
3. Teach word meanings before, during, and after reading.
4. Use context clues, semantic mapping and comparison, analogies, synonyms, antonyms, visual imagery, and other associations to teach meaning.

G. Reading Comprehension

1. Model "think aloud" strategies during reading.
2. Vary questions and ask open-ended questions that promote discussion.
3. Emphasize key strategies including questioning, predicting, summarizing, clarifying, and associating the unknown with what is known.
4. Use graphic or three-dimensional modeling of text structure.
5. Model and encourage flexible use of strategies, including self-monitoring.

H. Composition

1. Create a community of authors in the classroom.
2. Create frequent opportunities for writing meaningful assignments beyond journal writing.
3. Directly teach handwriting, spelling, punctuation, and grammar in systematic increments to promote automatic transcription skills.
4. Directly teach composition strategies through modeling and shared authorship.
5. Guide children through the stages of the writing process; publish and display children's completed work.

Part IV. Assessment of Classroom Reading and Writing Skills

1. Understand validity, reliability, and normative comparisons in test design and selection.
2. Identify varied purposes and forms of assessment (e.g., group comparison, measurement of progress, program evaluation, informing classroom instruction, individual diagnostic assessment).
3. Interpret grade equivalents, percentile ranks, normal curve equivalents, and standard scores.
4. Administer several kinds of valid instruments:
   a. graded word lists for word recognition;
   b. phoneme awareness and phonic word attack inventories;
   c. a qualitative spelling inventory;
   d. measures of fluency and accuracy of oral and silent reading;
   e. a structured writing sample; and
   f. inventories of graded paragraphs for comprehension.
5. Interpret student responses in comparison to benchmark cognitive and linguistic skills appropriate for age and grade.
6. Use information for instructional planning and classroom grouping. Use several kinds of assessment to measure change over time.

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Just about all children can be taught to read and deserve no less from their teachers. There is no more important challenge for education to undertake.

A Union of Professionals

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