Implementing Research-based Reading Instruction in High Poverty Schools:

Lessons Learned from a Five-year Research Program

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   A consensus has been reached among researchers on several major questions regarding reading instruction. How do normally progressing children learn to read? Why do some children have difficulty? What features of instruction are most likely to help the most children become good readers? The consensus of research is based on decades of scientific work funded by the US Department of Education, the National Institutes of Health, and many other institutions and agencies. Nevertheless, the consistent implementation of informed instruction grounded in reading research continues to be an enormous challenge. This paper synthesizes more than a dozen studies generated from a five-year, longitudinal program of reading research conducted in high poverty schools in grades K-4, as well as smaller scale investigations conducted by this researcher into the nature of children's reading, spelling, and writing acquisition. The characteristics of effective classroom instruction and small group intervention are the topics of interest.

Are Compensatory and Special Education Programs Enough?

   It is well known that students in schools who serve high-poverty populations are at much greater risk of reading failure than their more advantaged, middle class counterparts. Persistent achievement gaps between students of various ethnic, socio-economic, and linguistic backgrounds have been difficult to close, despite significant Federal and state investments in compensatory education programs. Many students who fall behind are assigned to remedial programs funded through Title 1, but studies of the effectiveness of compensatory and remedial education indicate that on the whole, these programs cannot be counted on to narrow the achievement gap. Some programs that have made a difference, such as *Success for All*, address much more than classroom or remedial reading instruction, embracing school scheduling and organization, leadership training, professional development, and small group tutorial interventions (Birman et al. 1987; Slavin, Karweit, and Wasik, 1994).

   Special education services, although costly, have also not been the answer to the achievement gap. Half of the 6.2 million students served in special education programs are classified as learning disabled, and about 85% of those children have serious and intractable problems with reading and related language skills (President's Commission on Excellence in Special Education, 2002). Students with serious reading

disabilities on average do not make any significant gains in relative standing if they are placed in special education between grades 3 and 6 (Hanuchek, Cain, and Rivkin, 1998; Torgesen et al., 2001). Special education placement usually offers too little, too late, when it comes to learning to read (Moody, Vaughn, Hughes, and Fisher 2000; Vaughn, Moody, and Schumm 1998; Zigmond et al. 1995). In order to make large-scale and significant changes in our national pattern of reading achievement, we must make a more concerted effort to capitalize on reading research, beginning with early, preventive, classroom-based approaches that will reduce the numbers of children who experience reading failure from the outset.

The major project with which I and my colleagues were involved for five years undertook an exploration of classroom reading instruction in high-poverty, urban schools serving predominantly African-American and mixed ethnicities. Funded by the National Institute of Child Health and Human Development[1] as part of its comprehensive program of research into reading acquisition, the project was headed by Barbara Foorman and co-directed by Jack Fletcher, David Francis, and myself. In the course of this study, we learned much about the variables that predict reading outcomes, the school and classroom factors that improve reading and writing achievement, the language learning characteristics of the children, and the needs of teachers who work in such environments.

The Research Context for the Early Interventions Project

Prior to the implementation of our study, consensus was building in the reading research community that much reading failure is unnecessary and avoidable through excellent, informed instruction (Brady and Moats, 1997). As the National Reading Panel concluded, the classroom reading program should include a strong code-emphasis component (Ehri, 2004; Foorman et al., 1998; Torgesen 2000). The most effective code-emphasis instruction is explicit, systematic, and cumulative, building skills on one another. Its goal is to teach students the correspondences between phonemes (speech sounds) and graphemes (the letters and letter groups, such as *th*, that spell the phonemes). In addition, effective lessons carry those skills into text reading and devote substantial instructional time to building fluency both at the word and text reading levels. Research-based instruction also includes robust vocabulary and comprehension

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components, no matter where the students are in word reading development, and an emphasis on the use of strategies in both word recognition and comprehension.

Code-emphasis instruction is necessary in the early grades because most reading problems unfold in the very beginning stages of literacy acquisition. The most important insight of modern reading research has been the recognition that phonics instruction may not "take" with young readers unless they are aware of the segments of speech represented by the graphemes used to spell words in an alphabetic writing system. Called phoneme awareness (PA), this foundational language skill requires conscious analysis of the internal details of speech, a linguistic achievement that is elusive for many students. Students who have difficulty acquiring PA may lack the experiences with language necessary to foster it, and/or may not be "wired" or biologically predisposed to figure out the structure of speech and connect that with print. Genetic predispositions for and against good reading skill operate through this underlying competence (Gilger, 2005). One of the most positive, recurring findings of research for the 20 years leading up to the mid-1990's was that children who lacked good phonological skills could be directly taught the identity of phonemes and how to mentally manipulate them. If this awareness was then linked with letters students were more likely to overcome early signs of risk for reading failure

The report of the National Research Council (NRC) (Snow et al. 1998), based on an expert panel's review of research in early reading instruction and intervention, identified the essential components of effective early literacy instruction which were later elaborated in the Report of the National Reading Panel (2000). These included (a) explicit instruction in the alphabetic principle, (b) teaching students to read for meaning, and (c) providing extended opportunities for practice reading connected text. In addition, oral language competency and writing skills were identified as necessary in a comprehensive lesson. The NRC was careful to point out that integration of these components of instruction was associated with the best results – that is, daily comprehensive lessons that included explicit teaching of the alphabetic code, development of reading fluency through a great deal of appropriate reading practice, and explicit teaching of comprehension skills and strategies.

Research on the timing, intensity, and composition of preventive and remedial intervention with students at risk also preceded our study (Torgesen, Wagner, Rashotte, Alexander, and Conway, 1997; Vellutino et al., 1996) and coincided with our study (Mathes & Denton, 2002). Using screening tests of

phonological skills and letter knowledge, researchers identified children in kindergarten who showed

significant signs of risk for reading failure. By second grade, in the Torgesen et al. study, small group,

daily intervention for _ hour over the academic year brought 75% of these children to grade-level reading.

Vellutino et al. also identified middle-class children with very low word recognition skills at the beginning

of Grade 1. After one semester of a comprehensive intervention that included decoding, fluency, and

comprehension components, 70% of the poor readers were reading at grade level. After two semesters,

over 90% were at grade level. Early intervention—in Grade 1 and 2—is more effective than later

intervention because intervention at grades three and beyond requires more hours, more expertise, and

more concentrated practice. Even then, reading fluency rates are seldom brought into the normal range

when remediation is begun after 2nd grade (Torgesen et al., 2000; Torgesen, in press).

In summary, consensus groups before and during our study had distilled decades of research into

recommendations for sound practices in early reading. Research had provided a description of instruction

most likely to prevent reading difficulties (Snow et al., 1998), benchmarks and standards to define

curricular expectations (Primary Literacy Standards, 1999; Snow et al., 1998), and meta-analyses that told

us which instructional practices were trustworthy (National Reading Panel, 2000).

The Early Interventions Project was designed to begin classroom and remedial intervention in

kindergarten and first grade and to follow children through the elementary grades to the end of grade 4.

With publishers' support, the project provided instructional materials to all classrooms and emphasized the

faithful implementation of those programs of instruction. Four core, comprehensive instructional programs

were used across the study, three of which had already been proven effective in reducing reading failure:

Open Court (see Foorman et al., 1998); *Reading Mastery*, a Direct Instruction program of SRA (Carnine,

Silbert, & Kameenui, 1997) and *Success for All (*(Slavin, Dolan, & Wasik, 1996) and one program that

represented a literature-based approach with supplementary phonics, Houghton Mifflin's *Invitations to*

Literacy. Funding was also provided to support individual tutorial interventions for 10% of the students.

The professional development provided to teachers was more extensive in the District of

Columbia site than the Houston site. In Houston, only three days were available for teacher workshops. In

DC, we provided an introductory summer workshop of 3-5 days, three additional professional

development days throughout the school year, and ongoing courses that met weekly for teachers who

voluntarily enrolled in them. A supplementary Congressional grant was received to support professional development. Publishers' consultants assisted with classroom visits and teacher mentoring in the implementation of the core programs. Principals were required to attend summer trainings and courses during the first year of the study.   Classroom observers from the research group were present 5-6 times during the school year in each classroom, on average, across both sites. Reading coaches were hired for each school for the fourth year of the study in the District of Columbia.

The study had two overriding and complementary purposes: a) to investigate the variables that contribute to reading success or failure in schools that are adopting research-based programs, and b) to improve reading instruction in the participating schools. Although controlled studies had already shown the effectiveness of specific practices, and the reasons why those were likely to work better than others, we gathered evidence pertaining to larger scale implementations of research-based reading instruction in high-poverty environments.

The Social, Political and Educational Context of the Early Interventions Project

According to the 4th grade NAEP results and our initial screening tests, between 70-80% of all students in the entering kindergarten classes were at risk for reading failure in the District of Columbia and in Houston ISD. The schools themselves had resisted many reform efforts in the past. Teacher turnover was high and the pool of certified, capable teachers was not sufficient to meet the demand. Expectations for staff and students were low, capable leadership was inconsistent or absent, and student transience was common. Aversive working environments where resources were scarce and demands overwhelming often challenged the patience, skill, and persistence of staff and students. For example, school libraries sometimes had no books and classrooms were devoid of instructional materials and resources beyond what our project provided. Basic equipment such as copy machines, overhead projectors, or working tape recorders were frequently missing from the schools. Schools opened late the first year because about 1/3 of the buildings' roofs were not up to safety codes.

Measurement of Overall Reading Improvement

Our study involved 1400 children in 17 low performing schools (8 in Houston and 9 in the District of Columbia). We followed the reading growth of children through fourth grade in two cohorts, one selected in kindergarten and the other in first grade. Children were assessed at the end of each year with an

extensive individually administered test battery, and four other times during the year with a brief set of "growth" measures on critical skills underlying reading acquisition. At the end of year four of the project, children who were finishing third and fourth grades were solidly at national average in both Houston and Washington (see Table 1), although there was considerable variability across individual teachers and schools (Foorman et al., 2001a, b).

The context for change differed dramatically at each site, in spite of the positive and similar growth observed across the study schools in general.   Houston Independent School District enjoyed stable leadership for many years, a nationally acclaimed district reading initiative, and a long-term accountability system at the state level.   Under such conditions, we expected that most schools would sustain positive growth in achievement; however, the sub-district where this study was located had three area superintendents in four years. Likewise, the District of Columbia Public School system had three superintendents in the first four years of the study. DC had instituted accountability (in the form of the Stanford-9 Achievement Test) during the second year of our project, but prior to that adoption, no data were available on students' progress in the primary grades. There was no district-wide reading initiative during the four years we worked in the District, so our schools had only each other for support.

Additional Findings Pertaining to Reading Outcomes

A number of scientific papers are now published that analyze data from the Early Interventions Project, as the grant was known. Major findings include the advantage of explicit over implicit instructional approaches in first and second grades (Foorman, Francis, S. Shaywitz, B. Shaywitz, & Fletcher, 1997; Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1997); the positive impact of phonological awareness instruction in kindergarten on Grade 1 reading outcomes (Foorman, Chen, Carlson, Moats, Francis, & Fletcher, 2003); the importance of teacher content knowledge, teacher allocation of instructional time, and overall teacher quality on literacy development through grade 4 (Foorman & Moats, 2004); and the complex interaction of instructional factors in grades 1 and 2 in determining grade 2 classroom results (Foorman et al., in press).

The roles of teachers, students, and classroom contexts have been evaluated for their ability to predict literacy outcomes through complex data analyses that allow researchers to understand the relationships among many variables in analyzing literacy outcomes. In one recent study, we report findings

regarding a) the extent to which literacy was a unitary construct, b) the differences between language competence and literacy levels, and c) the relative roles of teachers and students in predicting literacy outcomes (Mehta et al., 2005). Utilizing data from 1342 students in 127 classrooms in grades 1-4 in these 17 high poverty schools, we found that reading and spelling can be viewed as a unitary literacy factor, and that the role of phonological awareness changes as students learn to read. PA is a significant factor very early in reading development, but declines in importance as students progress.

We also discovered that word reading, reading comprehension, and spelling were highly inter-related across grades 1-4, even though written composition was less closely related to other literacy outcomes. We had observed earlier (Foorman and Schatschneider, 2003) that teachers spent very little time on either writing instruction or meaningful spelling instruction, and that spelling achievement lagged significantly behind reading at all levels. By the end of fourth grade, with implementation of research-based instructional programs and practices in reading, students had achieved average standard scores on the Woodcock-Johnson *Psycho-Educational Battery-Revised* (1989) Passage Comprehension (97 and 98 in DC and Houston), and average scores on the Woodcock-Johnson's (1989) Basic Reading Cluster (103 and 101 in DC and Houston), but spelling scores on the *Kaufman Test of Educational Achievement* (Kaufman & Kaufman, 1985) were significantly lower (89 and 87 in DC and Houston, approximately the 24th and 20th percentiles).

The Relationship between Teacher Knowledge, Teacher Competence, and Classroom Outcomes

Relationships among measures of teacher knowledge, teacher effectiveness, and student outcomes were studied at both sites. Teacher knowledge was measured by an experimental, 19-question multiple choice Teacher Knowledge Survey (TKS); teachers' general effectiveness in essential teaching routines and classroom management was measured with a structured observation instrument (TTAS; Texas Education Agency, 1984). The Teacher Knowledge Survey included questions about orthographic, phonological, and morphological aspects of word structure; the components of reading instruction; and the significance of specific spelling, writing, and oral reading errors in student work samples. Eighty third and fourth grade teachers, during the fourth year of the study, took the Teacher Knowledge Survey at the beginning of the year and the end of the year. They were also rated during that year by observers who had achieved high inter-rater reliability with TTAS (>.80; see Foorman & Schatschneider, 2004, for further description of

these instruments). Teachers rated as more effective in their classroom teaching techniques had students

with higher reading outcomes. Teachers with high attendance at the professional development meetings

had higher scores on the knowledge scale than those with low or no attendance, $t(43) = -2.63$, $p < .05$

(mean of 17.1 vs. 14.63). However, attendance in professional development courses did not translate to

higher ratings of teaching effectiveness in the classroom. Some very effective teachers chose not to attend

the classes we offered.

The very modest relationships we were able to demonstrate between teacher knowledge, teaching

effectiveness, and student outcomes support findings of other recent studies (Bos, Mather, Dickson,

Podhajski, & Chard (2001); Cunningham, Perry, Stanovich, Stanovich, & Chappell (2001); McCutchen,

Abbott, Green, Beretvas, Cox, Potter, Quiroga and Gray (2001); and McCutchen & Berninger (1999).

Results of Teacher Knowledge Surveys

Taken together, a series of teacher surveys given by this author to teachers of various levels of experience and

education have consistently found major gaps in teachers' understandings about language structure, reading

instruction, and the meaning of student assessments and work samples ( ). Knowledge surveys reliably demonstrate

that the most elusive concepts for teachers are: a) the differentiation of speech sounds from letters; b) the ability to

detect the identity of phonemes in words, especially when the spelling of those sounds does not directly represent the

sounds; c) knowledge of the letter combinations (graphemes) that represent phonemes in familiar words and

recognition of a word's regularity or irregularity; d) identification of functional spelling units such as digraphs,

blends, and silent-letter spellings; e) the conventions of syllable division and syllable spelling; f) the linguistic

constituents of a sentence and the recognition of basic parts of speech; g) the recognition of children's difficulties

with phonological, orthographic, and syntactic learning from work samples and assessments; and h) understanding of

the ways in which the components of reading instruction are causally related to one another. These results and those

of other researchers (Spear-Swerling) converge in suggesting that: a) teachers' knowledge of phonology and

orthography is routinely underdeveloped for the purpose of explicit teaching of reading or writing; b) teacher content

knowledge of language can be measured directly but is not closely associated with philosophical beliefs or knowledge

of children's literature; and c) teachers' knowledge of and ability to apply concepts of phonology and orthography is

related to primary grade children's reading and spelling achievement.

How Much Difference Does the Reading Program Make?

Throughout the studies generated by our research program, school, teacher, and child effects were more salient in accounting for reading achievement outcomes than effects of a specific program or method. Beyond the end of second grade, when Open Court classrooms were superior to Houghton Mifflin classrooms on decoding and spelling skills in the District of Columbia schools, program effects were not observed. In other words, the effect of the research-based, comprehensive program was overshadowed by the strong tendency for students to end up where they began. In addition, the general school climate, and the individual teacher's skill were more salient in accounting for achievement differences. Each of the four programs was implemented well and implemented poorly across our classrooms.

Those schools whose overall achievement was higher than others were characterized by the same qualities that characterized the Flagship Schools identified in a Texas survey (Foorman and Moats, 2003). There was a climate of mutual respect, pride in academic achievement, and collegiality evident in interactions among administrators, teachers, and students. Discipline was seldom an issue and children were generally on task. Time spent on reading instruction was a priority in every classroom, in small-group intervention, in specialized tutorials, and in extended-day activities. Teachers had "bought into" a particular instructional approach and they could explain the rationale for the approach and how it was used to prevent reading problems as well as to intervene with at-risk students. The approaches had in common the focus on explicit, systematic instruction in phonological skills and phonics. These elements were integrated with reading for meaning and reading widely. Teachers could report the results of student assessment and how these results translated into differentiated instruction. They communicated the results to parents and provided ways for parents to extend reading opportunities. They worked in horizontal and vertical teams and with specialists to articulate these plans within and across all grades in the school.

What Worked in the Professional Development Program?

Description of the PD program. In the District of Columbia site, professional development was multi-dimensional. It comprised an introductory summer workshop of 2 to 4 days, focused on program implementation; two or three, three-credit courses each year, focused on foundation concepts in teaching reading with any comprehensive instructional program; bimonthly visits to each classroom from observers;

monthly in-class visits and demonstration lessons from publishers' program consultants; semi-annual

meetings for principals and school-based change facilitators; and regular, informal contacts from senior

project staff. We thus maintained a continuous presence in the classes of all teachers, although only about

half enrolled in formal courses that met after school or on weekends. During the fourth year of the project,

reading coaches worked intensively with individual teachers in their classrooms.

In the District of Columbia site, courses on Phonological Awareness, Decoding and Spelling

Instruction, Writing, and Vocabulary and Comprehension emphasized the conceptual underpinnings and

research basis for effective classroom practice, as well as the links between those concepts and the practices

teachers used in their instructional programs. Teachers were asked to read, discuss, and summarize points

from professional journal readings. Each topic was addressed in depth. In each class, we anchored practical

teaching strategies to a larger theoretical framework, such as a model of reading processes, a model of

reading instruction components, and a model of reading and spelling development.   Throughout the

courses, we emphasized the structure of English phonology and orthography. The interplay between theory

and practice was continual, redundant, and consistent, just as Birman, Desimone, Porter, and Garet (2000)

report in their analysis of effective professional development projects that were part of the Eisenhower

Professional Development Program.

Kindergarten to Grade 2 teachers in the District of Columbia site were taught to use an early reading

assessment (i.e., the Texas Primary Reading Inventory; Texas Education Agency, 2001) and a

developmental spelling inventory (Bear, Templeton, Invernizzi, & Johnston, 1996) to flag poor readers.

Teachers in Grades 3 and 4 used an informal word list and passage reading inventory to group children for

differentiated instruction. The project, however, did not emphasize periodic administration and analysis of

classroom assessments, although many teachers independently screened their children.

Teachers' views of their professional development experiences. We interviewed 50, K-4th grade

teachers who had been with the project for two years or more to elicit teachers' impressions of our

professional development efforts. Interviews were conducted, taped, and transcribed to preserve teacher

anonymity.

Forty-nine of the 50 teachers characterized their experience in the project as "positive" to "extremely

positive"; many expressed regret that the project was ending. No teacher identified the payment of stipends

as a primary motivator for their involvement in courses. Rather, teachers linked their enthusiasm to improved student outcomes, the achievement of greater insight into the teaching of reading, the availability of material support, and enjoyment of a supportive, collaborative professional context in which learning was rewarding, reciprocal, useful, and exciting.

Teachers recognized immediate and long-term student gains on both classroom assessments and the District's Stanford-9 testing, attributing those gains to their own professional growth. Many stated specifically that they succeeded with at-risk, reluctant, and poor readers whom they had not been able to reach in previous years. Many stated that "all children can learn to read" if the programs are properly taught.

Teachers' views of conditions that support improvement. Many teachers commented that their own gains in phonological and phonic knowledge had a major positive impact on children's reading achievement.   The information about language was new, even to those who had taught for many years. Knowledge of "sounds", when coupled with opportunities to learn and practice specific instructional techniques and strategies, was empowering.

Teachers expressed gratitude that, for the first time, they were working with comprehensive reading programs with all necessary support materials. Prior to the project's intervention, many had been working with few instructional materials, few books, and no working mechanical equipment such as tape recorders or overhead projectors. Teachers welcomed feedback, guidance and encouragement given with the expectation of gradual, incremental improvement toward clearly defined teaching standards. They enjoyed watching model lessons, visiting peers' classrooms, role-playing during workshops, receiving tips from staff members, and team planning. Many valued the reciprocity embedded in the professional development learning experience. No teacher expressed a preference for being left alone or teaching without a core, comprehensive set of instructional materials.   The importance of collegial networks for sustaining research-based practice has been noted as well by other researchers (e.g., Little, 1993; McLaughlin, 1994).

Teachers welcomed the structure imposed by project staff in the form of pacing guides, lesson scripts, and lesson plans. No teacher complained that structure and well-defined expectations for time management, pacing, or instructional priorities were either stifling or limiting. Rather, many protested that they had been overwhelmed by too many choices of activities in publishers' teaching manuals and too little

assistance choosing essential lesson components. Several teachers mentioned that creativity was possible within the structure provided; only one wanted less repetition in a program routine, although she admitted that repetition was effective for the children.

In summary, the model of professional development was enthusiastically endorsed by participating teachers. Sound, rigorous, consistent content; a constant interplay between knowledge, understanding, and improvement of classroom practices; permission to make gradual improvement over time; and the creation of a positive, rewarding professional and social context in which to learn and work were the factors most often praised by teachers.

Post-hoc reflections on the process of teacher growth. As we have become distanced from the project itself, we realize that some of the positive momentum over several years accrued because we allowed for incremental growth in teacher knowledge (Elmore, 1996). Kindergarten and first grade teachers were involved in workshops, courses, and mentoring within the first year; in subsequent years, one additional grade level was included in the trainings while the teachers at younger grade levels were encouraged to attend all additional trainings. Teachers were allowed to repeat courses by choice, and some did so even three times in successive years. Cumulative growth was also supported. When observers identified teachers having trouble with implementation, a reading coach or publisher's consultant would visit the class and team teach or demonstrate. Several teachers showed dramatic improvement year to year with this individual support. High implementing teachers were sometimes used as models for their peers, although principals needed help knowing how to handle disparate abilities within a grade level teacher team.

Screening and Prediction for Reading Problems

Evidence from many other longitudinal studies, in addition to ours, converge on a restricted set of valid predictors for the identification of children at-risk for reading difficulties: phonological awareness and identification of letter sounds; rapid naming of letters; vocabulary knowledge; and word reading, especially word reading fluency (Fletcher et al., in press; O'Connor & Jenkins, 1999; Torgesen, in press; Vellutino, Scanlon, & Lyon, 2000; Wood, Hill, & Meyer, 2001). These studies all found that the predictive validity of phonological awareness tasks depended upon how and when these skills were assessed. Schatschneider, Francis, Foorman, Fletcher, & Mehta (1999) applied item response theory to a pre-

publication version of the *Comprehensive Test of Phonological Processing* (CTOPP; Wagner, Torgesen, & Rashotte, 1999) and found that the subtests measured the same underlying construct but that tasks varied in their predictive value at different points in development. For example, in kindergarten initial sound comparisons and blending of onsets and rimes are predictive of first-grade reading, while in first grade it is blending and segmenting of multiple phonemes that predict end-of-year reading success. Moreover, assessments at the beginning of kindergarten are less reliable than those at the middle or the end, as children need time to acclimate to the school environment (Fletcher et al., in press). Finally, letter-sound identification is more predictive than letter naming in the second half of kindergarten and the beginning of first grade because identifying the sounds of letters is inherently a phoneme segmentation task directly related to phonological decoding of words. Speed of naming letters is predictive of Grade 1 reading because many letter-names do contain the sounds represented by those letters (e.g., long vowels) and the automatizing of this knowledge should, again, help with phonological decoding. These insights are incorporated into early screening instruments including DIBELS and the Texas Primary Reading Inventory.

Writing: The Forgotten Component of Language Arts

Each year, a structured writing sample was obtained from students in May. We undertook an intensive analysis of the writing skills of 40 4th graders, randomly selected from classrooms where we had observed high and low quality writing instruction. Although we were able to show the positive effects of stronger writing instruction on students' compositions, striking and unresolved problems of language formulation, transcription, and usage were ubiquitous across the writing samples. Although our students were scoring within the average range on standardized reading tests, spelling and writing were not developing at average levels. Spelling was highly correlated with reading, but spelling was developing at a comparatively slower rate, as previously noted.

Similar to students with language learning disabilities (LLD), our high-poverty students also appeared "overwhelmed by the multiple demands of …writing and appear to have difficulty allocating sufficient cognitive resources to meet various writing demands…" (Singer & Bashir, p. 559). The 40 students in our study, however, were not designated as LLD; they were average students in classrooms of struggling urban schools serving high-poverty, minority populations, whose instruction had typically been of poor quality or nonexistent. In spite of the relative success the students had achieved in reading, through

a longitudinal effort to scale-up reading interventions, these 4th grade students had not mastered the

foundational language skills needed to support the cognitive management of planning, organization, text

generation, and on-line revision in composition.

        The large majority of students generated personal narratives or descriptions that lacked true

narrative structure and that comprised an apparently unplanned, associative rendering of thoughts or events

characteristic of very beginning writers (Bereiter & Scardamalia, 1987). Cohesive devices were scarce

beyond basic time-ordering words and additive conjunctions. To deploy attention and working memory in

the service of explicit planning, organization, text construction and self-regulation strategies during the

writing process, students must automatize many component skills of written language production

(Berninger, 2000; Berninger, Cartwright, Yates et al., 1994 ; Graham, 1997). These include handwriting

fluency and legibility, and knowledge of spelling, word form, basic sentence structure, punctuation and

other conventions of written expression. Rapid, automatic access to the form of letters, words, sentences,

and paragraphs is necessary if the writer is to keep an organizational plan in mind, monitor what has been

written and what needs to be said, and link the words referentially. Our students' ability to generate

language at the levels of verb form, clause construction, word endings, punctuation and orthographic

patterns was very problematic considering the students' average reading scores, and most certainly

undermined their ability to juggle the cognitive demands of composition.

        Our students' limited vocabularies, documented in the parent study as being significantly below

average (7th %ile in the study population when the study began), undoubtedly contributed to their

dependence on repetitive uses of the same words and to under-elaboration of thoughts and ideas. The topic

was provocative (When I Was Frightened) and compositions contained multiple references to violence,

vulnerability, monsters, and various environmental threats. In this case, topic knowledge and engagement

in the task may have been higher than would have been the case with a more banal assignment. The

students had something to say, but nevertheless struggled to write.

        In spite of the below average writing skill exhibited by these students, we were able to measure the

quality of the instruction they received in 3rd and 4th grade and its impact on their productivity. Overall, our

observational data indicated that very little time was spent on instruction in these classrooms, and that 1/3

of the teachers did not even teach composition. Children's self-efficacy and ability to deploy productive

writing strategies almost certainly were impacted by lack of instruction and practice. Beyond finding the evidence for insufficient instruction, however, we did document a more hopeful effect: writing can improve, even in children of low verbal skill, when higher quality instruction occurs as late as fourth grade.

Students who wrote more (and who were likely to have better quality instruction) may well have adapted better attitudes and expectations of themselves as writers. In one classroom, for example, where the instruction was rated as higher quality, several students spontaneously generated a graphic organizer before writing a draft, even though only _ hour was allotted for the structured writing task. The graphic organizers were not necessarily meaningful, but the children who tried to generate graphic organizers had apparently been instructed in the importance of writing with a plan and a goal.

 Part of our analysis probed in detail the specific difficulties the children experienced with the representation of words at the phonological, orthographic, and morpho-syntactic levels. Mastery of these structures is fundamental to the ability to write conventional school English. In addition, those who have mastered the basics are more likely to handle the multiple demands of the writing process because transcription skills have been automatized.

At the most basic level, students' fluency of output depends on their mastery of graphomotor skills of letter formation, alphabet production, word knowledge, grammar and spelling. About 1/3 of the 4th grade students demonstrated very poor handwriting, which is known to interfere with compositional quality and fluency (Berninger et al., 1994). Handwriting problems were most likely attributable to lack of instruction, as so little direct teaching of writing skills was observed in earlier grades.

Halliday (1985) described the transition necessary in writing development from the transcription of conversational language, characterized by linear strings of ideas and unclear sentence boundaries, to academic or literary language, characterized by a much higher degree of embeddedness: adverbial clauses, relative clauses, appositives, passive voice, logical connectors that signal propositional relationships, infinitives, and prepositional phrases. Most normally progressing children are well on their way through this transition by the end of grade 4 when reading fluency has been achieved. For example, between grades 3 and 5, most children make rapid gains in their ability to analyze, interpret, and produce morphologically complex words, which become more and more prevalent in written academic text (Anglin, 1993), and their spontaneous writing typically shows consolidation of inflected forms and beginning use of derived forms.

The children in our sample, however, commonly demonstrated difficulties with the phonological, morphological, and grammatical representation of linguistic structures in their spontaneous writing that undoubtedly contributed to the "low average" overall ratings and the disparity between their average reading scores and their low compositional quality.

The ability to read standard academic English for comprehension does not appear to be sufficient to enable students with dialect differences and/or linguistic disparities to represent standard English forms in writing by the fourth grade level. The awareness of and representation of speech sounds with graphemes, awareness and representation of morpho-syntactic structures in spelling, and awareness and use of standard word and sentence forms each depend on the development of specific linguistic awarenesses (Bryant, Nunes, & Bindman, 2000) as well as, perhaps, a non-specific level of metalinguistic awareness that supports such skills as intrinsic and automatic comparison of dialects (Charity et al., 2004). As a tool to develop linguistic awareness, many applied linguists recommend that teachers teach students to contrast formal and informal grammatical patterns as part of writing instruction (e.g., Wheeler & Sword, 2004).

It is not possible to know, given our data, whether the children who struggled with the written representation of speech sounds, inflectional morphemes, and grammatical forms would have exhibited tacit awareness of these structures, for example on a recognition task, but were limited in their explicit and conscious expression in writing simply from lack of direct teaching and practice. Likewise, it is not possible to know how many children were lacking even tacit awareness of the standard academic English structures they were to use in written expression.

How best to teach language and writing skills to high risk students in low-performing schools deserves the kind of vigorous research effort that is now underway in reading. We cannot assume that teaching reading is enough to enable students with language differences and disadvantages to master the multiple skills of writing. How much, what kind, what intensity, and the timing of explicit teaching about phonology, graphomotor production, morphology, English grammar, and text structure that will be necessary to support gains at higher levels of composition (ideas, organization, coherence, voice) are urgent questions for educators to resolve. At the very least, a renewed campaign to promote explicit teaching of writing processes and the skills that support them would seem an overdue correction in federal and state reading initiatives.

Lessons Learned and Why There is Hope

The Use of Curricular Materials

As Ball and Cohen (1996) discuss, high-quality professional development related to the implementation of novel curricular materials and assessments, holds an important key to the success of any reading and language initiative. Teachers' knowledge of the subject matter and the way it is presented in the materials; their beliefs about instructional priorities; their ability to make instructional decisions based on evidence, and their personal teaching philosophy and style will all have an impact on what they do. Well- constructed and validated instructional materials are a necessary and important aspect of quality implementation of educational programs, merely disseminating these materials is unlikely to strongly impact teachers' behavior, without attention to their attitudes, goals, and knowledge base.

Timelines for Teacher and School Growth

Successful and sustainable programs that reduce reading failure require several years to implement and require a school culture conducive to educational growth and change. As Denton and Fletcher propose (2005), projects with a history of success include phases such as (a) planning and preorientation, including the establishment of the school/program partnership, commitments, and selection of a district facilitator; (b) orientation, including baseline data collection, training of school personnel, and the establishment of teams; (c) transition, in which the program is in place, the process is documented, and follow-up consultations are provided by the program staff; (d) operation, characterized by increased self-sufficiency, continued process documentation, and assessment of outcomes; and (e) institutionalization, in which the program is integrated into the routine operation of the school. Sometimes up to five years are necessary before the maximum affect of a reading initiative is realized (King and Torgesen, 2006).

Teachers are motivated when their students respond to the instructional program and activities and when they are adequately prepared to implement the program with confidence (Klingner et al., 1999). In our study, teachers have also noted the importance of a support network and teamwork -- both the support of an on-site facilitator or coach and the support of their colleagues who were also engaged in the project. Teachers enjoy breaking down the isolating barriers between their classrooms and a supportive professional community.

Gersten and his colleagues (1997) reviewed existing literature on the subject of sustainability. Their summary suggested that sustainable interventions are practical, concrete, and have a high degree of specificity, reflecting the realities of implementation by teachers whose time and attention are consumed by multiple demands. As in the study by Klingner et al. (1999), the Gersten et al. review noted the importance of professional development in which teachers are provided with multiple opportunities to practice new procedures and receive helpful feedback, and in which the professionalism of teachers is emphasized through engagement in joint problem solving activities. Likewise, it is important that teachers maintain continuing supportive interactions within collegial support networks, providing them with opportunities to discuss connections between research and their real everyday classroom situations. Above all, sustainable instructional innovations must result in the recognition by teachers that their efforts have paid off in the form of increased student learning.

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Variable	DCPS	HISD
KTEA Spelling: Standard Score	89.30 (11.21)	87.00 (11.65)
WJ Passage Comp. W Score	489.55 (14.33)	493.30 (15.20)
WJ Passage Comp. Standard Score	97.02 (11.96)	97.80 (13.96)
WJ Basic Cluster W Score	496.07 (19.15)	495.37 (19.68)
WJ Basic Cluster Standard Score	103.16 (19.05)	100.66 (18.97)

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Theory and Research Provide a Solid Foundation for Teacher Training

The disciplinary knowledge base we need for teacher preparation is more likely to be embraced and promoted if it rests on a consensus model of reading development. If teachers learn (as this author once did, as a beginning teacher) that students' reading depends more than anything else on gender, IQ, family's education, socioeconomic status, handedness, or "learning style," pedagogical choices are likely to miss the mark. If teachers are taught, as many still are, that literature comprehension should be the paramount focus of beginning reading instruction, and that decoding will be mastered naturally, through exposure to books and motivational experiences, then their at-risk children have a lower chance of success (National Reading Panel, 2000). It is safe to infer that teachers who understand the general progression of reading development supported by research (e.g., Ehri & Snowling, 2004) are more likely to differentiate instruction on the basis of defensible principles. Unlike some other areas of education, reading instruction can be predicated on a scientific foundation. We do have replicated, validated, accepted theoretical frameworks on which to base our practice.

Most reading scientists agree, for example, that reading and writing difficulties are associated with inefficient, inaccurate, or underdeveloped language processing (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001; Stone, Silliman, Ehren, & Apel, 2004). Reading failure is not, as once believed, the product of poor mothering, low IQ, or lack of motivation. Most scientists agree that reading is an unnatural, acquired language skill that requires mastery of a written cipher or code through which speech and language are accessed. Spelling and writing require the inverse of that process and are even more demanding than reading. Human talent for reading and spelling is normally distributed and to a considerable extent is genetically influenced (Olson, 2004). Thus, the teacher's challenge is to defy the predictions based on incoming levels of reading ability. Instruction of specific language processes, including efficient letter recognition and recall, fast and accurate phoneme-grapheme and grapheme-phoneme correspondences, and word recognition, will enable passage reading accuracy and fluency, and the knowledge that accrues as a result, by the end of first grade and beyond (Cunningham & Stanovich, 1991; Foorman et al., in press; Mehta et al., 2005). In addition, vocabulary, verbal reasoning ability, and background knowledge will account for an increasing proportion of overall reading achievement as children progress through school (Torgesen, 2005).

Teachers must also realize that economically and educationally disadvantaged children may know half as much vocabulary as children from middle-class homes with educated parents (Biemiller, 1999) and that vocabulary enrichment is a cornerstone of good teaching. Those children are also likely to be unfamiliar with the academic or formal English language patterns read in books or required in writing. Learning to read early increases the chances that the children will read more and that the children's vocabulary and language skills will improve. However, by the intermediate grades, a majority of "at risk" children are overwhelmed by the language demands of academic, expository writing (Moats, Foorman, & Taylor, in press).

Effective instruction is often described in terms of "big ideas" or "essential components," (e.g., Coyne et al., 2006), but, in practice, a considerable amount of detailed knowledge of language structure and reading processes is necessary for high quality instruction beyond those general concepts (Moats, 1999). Phonological awareness instruction for young children, which should eventually support the mastery of phoneme blending and segmentation, requires the teacher to differentiate syllables (e.g., *ac -com- plish*) from onsets and rimes (*pl-ate*) and to count, produce, blend, segment, and manipulate the individual speech sounds in words (p-l-a ʃ - t). Phonemes must be differentiated from letters to clarify for learners the nature of speech to print correspondence (e.g., *which* and *witch* each have three phonemes and five letters). Phonological awareness, moreover, is supported by clear pronunciation of phonemes, syllables, and words. Vocabulary acquisition is facilitated when children's attention is directed to subtle differences in word forms such as *consist* and *assist*, *specific* and *Pacific*, and *flight* and *fright*.

Phonics instruction in English requires the teacher to lead students through multi-layered, complex and variable spelling correspondences at the sound, syllable, and morpheme levels, and to appreciate the relationship between language history and spelling patterns (Snow, Griffin, & Burns, 2005). Word recognition, if properly taught, includes much more than a letter-sound correspondence for each letter of the alphabet. Speech sounds and the alphabet letters do not align perfectly in English. There are more speech sounds than letters (e.g., 15-18 vowel phonemes and 6 vowel letters) and letters are often used in combination (e.g., ee, ea, e-e, ey, eigh) to spell those sounds.

Teaching students to read with fluency necessitates the instruction of automatic, accurate word recognition, which rests in part on the ability to process syllables and morphemes found in longer words. Recognition of prefixes, suffixes, roots, and parts of compounds, and recognition of the morphological structure of words to which inflections

have been added, facilitates word recognition, access to word meaning, and recall for spelling. Many children do not intuit these aspects of word structure without being taught.

Thorough instruction of word meanings includes explication of a word's structure and pronunciation as well as its grammatical role and relationship with other words in the semantic field. The teacher's verbal behavior during instruction is a key to teaching vocabulary, as children's exposure to words may occur only in the classroom context. In addition, many aspects of comprehension instruction rest on the teacher's skill in talking about and conveying awareness of word meanings in context, text organization, genre, inter- and intra-sentence references, figurative and idiomatic language, and the complex sentence structure found in academic discourse.

To integrate all of the "essential" instructional components, as well as writing and oral language use, an informed teacher also understands that they are interdependent. For example, vocabulary learning is facilitated by phonological ability (Baddeley, Gathercole, & Papagno, 1998), and students' ability to write well is related to proficiency in using phonic word attack strategies (Berninger & Richards, 2002; Hooper, Swartz, Wakely, deKruif, & Montgomery, 2002). The "essential components" so touted in Reading First and other policy documents are more intertwined than they are separate. Again, language processing is a unitary construct underlying the acquisition of reading skill (Mehta et al. 2005).

In the scientific community, agreement on these basic points has accumulated for over 30 years. One might assume that they had found their way into teacher training and licensing programs. What is the evidence that they have?

A small but growing body of work is explicating what teachers typically know about language and reading, how teachers' reading instruction is informed by that knowledge, and how teachers learn the concepts and practices of their discipline. While the level of knowledge and ability that distinguishes an adequate teacher from an inadequate or an expert one, or a general education teacher from a specialist, is yet to be determined, some assumptions are justified about what any teacher of reading, spelling, and writing should know. Recognition of the prominent role of English phonology in reading development, for example, justifies the expectation that teachers of reading can pronounce, compare, and manipulate the speech sounds of English, and that they know the difference between speech sounds and spellings. Similarly, the existence of complex syntax in academic written language requires teachers' awareness of simple, complex, and compound sentence structures and how to build students' facility with these structures. Not only should teachers know the structure of their own language, but they must have

some basis for understanding how second language learners of English acquire language proficiency, and they must be able to use various kinds of assessment data to individualize instruction. Where are the documented strengths and weaknesses in what teachers typically know?

Studies of Teachers' Subject Matter Knowledge

An exploratory study reported more than a decade ago (Moats,1994, 1995) examined 52 graduate students' responses to a survey of their knowledge of spoken and written language structures particularly relevant for teaching reading. All graduate students were licensed, practicing teachers with between 2 and 20 years of teaching experience. On a pretest, teachers demonstrated surprising difficulty on items that asked them to identify words with consonant blends, consonant digraphs, inflectional and derivational morphemes, and position-based spelling patterns such as the use of the spelling –ck. Levels of knowledge were not related to whether the teachers were in special or regular education roles, or how many years they had taught. Soon thereafter, additional descriptive studies emerged in the research literature on the declarative knowledge and beliefs held by teachers with varying backgrounds and degrees of experience (Bos, Mather, Narr, & Babur, N., 1999; Bos, Mather, Dickson, Podhajski, & Chard, 2001; Mather, Bos & Babur, 2001). Others explored the relationships among teachers' knowledge of language, cultural literacy, beliefs, ability to instruct, and student outcomes (Foorman & Moats, 2004; McCutchen, 2002a; McCutchen, 2002b; O'Connor, 1999).

Bos, Mather, Dickson, Podhajski, and Chard (2001) compared the responses of preservice educators (teachers in training) to those of inservice educators (experienced teachers) on a self-report form and knowledge survey. The experienced teachers were more positive about the need for explicit reading instruction; the inexperienced were more sold on implicit strategies favored by whole language proponents. The experienced teachers knew somewhat more about language structure at the levels of phonology and orthography; the inexperienced knew less even though they were involved in a licensing preparation program. All teachers showed a very weak grasp of phonological concepts and phonics. As in the earlier Moats study, problem areas for teachers included awareness of consonant blends, digraphs, and syllable structures. It is not surprising that in Hill's (2000) interviews with teacher candidates in four major universities, experienced and inexperienced teachers alike felt only somewhat prepared to teach struggling readers.

McCutchen et al. (2002a) focused on measurement of kindergarten and 1st grade teachers' knowledge and the relationship of growth in that knowledge base to student outcomes. Teachers' (n = 44) initial knowledge of terminology and concepts in early reading instruction was very low in comparison to what the researchers expected. However, researchers also demonstrated that their experimental teachers' (n = 24) understanding of phonology and early reading could be significantly improved in a 2-week summer institute. Devoting considerable time to explicating the difference between the English spelling system and the speech sound system, McCutchen and her colleagues emphasized phoneme counting, phoneme-grapheme matching, identification of syllable spelling conventions, awareness of regularities and irregularities in English orthography, differentiation of syllables and morphemes, and the ability to plan beginning reading lessons. A core, organizing principle for teachers' instruction was the continuum of phonological awareness development: compounds, syllables, onset-rime units, and then phonemes. Teachers studied the relationship between reading and writing as they examined young children's spelling attempts and learned techniques for teaching phoneme awareness, letter formation, handwriting fluency, spelling, vocabulary, and sound blending during decoding. Researchers did not attempt to control or account for teachers' choice of instructional materials; rather, the 24 participating teachers used varying tools in their K-1 classrooms.

After one year of monthly follow-up meetings, students in the experimental teachers' K and 1st grade classes obtained significantly better results than comparison students in phonological awareness, oral reading fluency, reading comprehension, spelling, and compositional fluency. The amount of time teachers spent on explicit teaching of phonological skills predicted how much growth students showed in phoneme awareness. With their new knowledge and a perspective on reading development, kindergarten teachers spent more time on explicit teaching of phoneme awareness and letter formation than the control group teachers; 1st grade teachers spent more time on explicit teaching of reading comprehension strategies as children learned to decode. The study concluded that teachers can deepen their knowledge of phonology and orthography in a 2-week institute, with periodic follow-up, and the knowledge that teachers gain affects their behavior in the classroom. Kindergarten and first grade students' achievement on most key variables can improve significantly as a consequence.

Another study by McCutchen's group (McCutchen et al., 2002b) investigated the ways in which 59 kindergarten, first, and second grade teachers' knowledge of children's literature and their knowledge of English phonology corresponded to each other and to philosophical orientation, classroom practice, and student learning. Teachers' philosophical beliefs about reading instruction bore little relation to their practices. Teachers' classroom practices in early reading instruction, however, were influenced by their phonological and phonics knowledge, which in turn predicted student outcomes in end-of-year word recognition abilities at the kindergarten level. The predictive relationship between teacher knowledge and student reading outcomes in 1st and 2nd grade did not hold, however.

Cunningham, Perry, Stanovich, and Stanovich (2004) documented in a large-scale study that teachers' self-evaluations of their own knowledge of language structure are not very reliable. Teachers who knew less about phonics actually knew more than teachers who thought they were strong in the subject matter. The study indicated that teachers often do not know what is missing from their disciplinary knowledge base, especially in the areas of phonology and phonics.

Spear-Swerling and Brucker (2003, 2004) have investigated the relationship between novice teachers' word structure knowledge and the progress of second grade children they were tutoring. Teachers' post-test knowledge of phoneme-grapheme correspondences, following a reading methods class and supervised tutoring experience, and their ability to distinguish regular from irregular spelling patterns in English, were associated with the tutored children's progress in word reading. The authors also reported relatively low levels of knowledge in incoming teacher candidates on pretests of word structure knowledge, and commented that even 6 hours of course instruction was not sufficient to bring all teacher candidates up to the ceiling of the test.

Moats and Foorman (2003), in a large-scale, longitudinal study of reading instruction in high poverty schools serving minority students, investigated the relationship between teachers' knowledge and student achievement in 3rd and 4th grade classrooms. Regression analyses were conducted at the end of year four of the study to illuminate the relationships between teacher knowledge of language and reading, overall instructional competence, site, and reading achievement. Analyses revealed a significant but modest relationship between overall teacher competence, as measured by a standardized observation checklist, and 3rd and 4th grade students' end-of-year achievement on the Basic and Broad Reading scales of

the WJR-Revised ($F(1,82) = 4.46$ and 4.87, $p < .05$, respectively). Effect sizes were small but significant.

Teachers rated as more effective in their classroom teaching techniques had students with higher reading

outcomes. Scores on the Teacher Knowledge Survey were also related to Broad Reading achievement

across both sites ($F(1,82) = 7.55$, $p < .05$.) Teacher knowledge scores predicted end-of-year Basic Reading

skill in one site of the two cities involved in the study. The lack of statistical prediction was attributable to

the restricted range of scores in the second site, where many teachers scored close to the ceiling of the test,

possibly because they had had more direct instruction in language concepts and more intensive professional

development than teachers at the first site.

Teachers who attended professional development courses regularly scored higher on the knowledge

survey than those with low or no attendance, $t(43) = -2.63$, $p < .05$ (mean of 17.1 vs. 14.63 out of 19

questions). In other words, high attendance at course sessions produced the ceiling effect discussed above.

However, participation in professional development courses was not related to overall competence ratings

on the teacher observation scale, as some capable teachers did not attend professional development, and

some of the poorer teachers did. Overall, attendance at professional development courses focused on

phonology and reading research, phonics and spelling, vocabulary and comprehension, and teaching

writing, produced measurable effects on teacher's content and disciplinary knowledge that in turn were

related to students' overall reading achievement. Experienced, working teachers at all primary grade levels

were able to acquire reading content knowledge in summer institute and after-school courses, and those

who learned more tended to produce children with higher reading achievement.

Foundational Knowledge and Pedagogical Behavior: How Related Are They?

A critic of these studies might argue that teachers do not need to convey information about

language structure to children if they can teach the children to read the words, and/or that knowledge is

only weakly correlated with pedagogical competence. Certainly, one unanswered question is whether the

"threshold" of adequate knowledge to support instruction is relatively low or high. This is a very difficult

question to study because in order to know the answer, we must be able to both define and observe what the

teacher's goals and intentions are in order to define a successful outcome. Many children learn to read

words without being fully aware of speech sounds, syllables, morphemes, or the grammatical structures of

sentences, for example. But I would argue that teachers who can shed light on the details of language at all

levels (sounds, letters, syllables, morphemes, grammar and subtleties of meaning) are fostering word consciousness or linguistic awareness that generalizes to all aspects of verbal learning. Appreciation of the structure, meaning, and origin of words, for example, is a factor in spelling, vocabulary, and word choice in verbal expression. No teacher's manual is adequate for promoting the rich dialogue about language that is characteristic of effective teaching.

If teachers were simply a conduit of information imparted from a heavily structured program manual, we could, perhaps be less concerned about whether they understood the intent or the outcomes of their instruction. But early identification of reading problems, preventive intervention, and progress monitoring are now commonly expected in schools, often under the guise of "Three Tier" intervention models (Fletcher et al., 2005). At the first "tier" of instruction, the regular classroom teacher is given support to implement a comprehensive program. Approximately 75 to 80% of the children should read at grade level by the end of 1st grade if the program is a good match for the class. In the second tier of service, small groups of children who are mildly at risk or somewhat below benchmark are instructed with methods that reinforce and extend the classroom program. In the third tier of intervention, a few children who are not progressing are given intensive, individualized, and often special education services. Thus, in addition to teaching itself, teachers are now required to identify children early who may have problems learning to read, and to intervene by selecting and implementing validated approaches that fit the profile of selected groups. To do this, teachers must know how to interpret data from validated screening tests such as the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) (Good & Kaminski, 2005). Teachers must base decisions about which skills to emphasize with what children, and how intensively to teach them, with screening and diagnostic data. But how well equipped are teachers to perform these tasks?

Our research team recently administered a newly designed Teacher Knowledge Survey to 139 primary grade teachers in two districts in Utah and Florida who were participating in a study of professional development. In the participating schools, DIBELS assessment had been mandatory for at least one year, and teachers were expected to group children and tailor instruction according to the screening test results. On the knowledge surveys we gave to teachers, we discovered surprising misconceptions and gaps in their understanding of the foundation concepts that should be driving data-based instructional decisions.

Selected items from the Teacher Knowledge Survey (TKS) and average pass rates for each item are included in the Appendix. Of note, beyond the usual weaknesses that we have previously documented in teachers' knowledge of the structure of spoken and written language, is the misunderstanding in many teachers of the very principle on which early reading screening assessment is based. Teachers were asked if this statement were true or false: "Screening at the end of kindergarten can be efficient, reliable, and valid for predicting a child's silent passage reading comprehension at the end of 3rd grade." Only 39 percent of respondents knew that that statement was true. Nevertheless, every participating teacher was ostensibly using DIBELS results to group children and plan instruction. Clearly, mandated use of the tool was not sufficient to enable practicing teachers to understand why it measures what it measures (foundational reading skills) or the import of the data it generated.

Other results on our current TKS reinforce and extend findings that have been reported in previous studies. About one-third of the teachers could identify the phoneme-grapheme correspondences in "straight" and about one-half could match phonemes and graphemes in "lodged." The poorest results occurred on all questions having to do with knowledge of morphology and word structure. When asked which word has an adjective suffix: *natural, apartment, city, encircle,* or *emptiness*, only 7 % of respondents correctly identified "natural." Unfortunately, this result may indicate that the teachers had had so little instruction in language, including basic grammatical terms, that they could not differentiate an adjective from three nouns and a verb.

A Personal View of the Predicament We Are In and What We Should Do About It

Testimonials and opinions are hardly scientific evidence for the effectiveness of any given approach to instruction, whether we are focused on novice readers or career teachers. But I and my colleagues now have more than 20 years of experience working with teachers in graduate programs and in professional development and continuing education classes. Through repeated feedback from teacher participants, we have come to realize that licensed teachers usually have no contact with the research literature to which "scientifically based" reading instruction mandates refer, and often have little or no knowledge of their own language. What they do learn about reading psychology is reduced to slogans, "big ideas," and bulleted lists. Coursework and other learning experiences we have developed, therefore, allow enough time on each topic for teachers to gain insight into the processes and content of learning to reading

and write, if generalization to purposeful teaching is to occur (Moats, 2004). Little is gained by the "once over lightly" or "spray and pray" approach so common in professional development, wherein all of the "components" of instruction are covered in a few days without sufficient attention to background concepts.

We first develop insight into reading acquisition with a "learning to read" exercise that uses a novel (IPA) symbol system. The goal is for the participating teacher to empathize with the novice student's expectation of learning, fear of failure when sounds cannot be associated or symbols cannot be recognized, and befuddlement when words cannot be deciphered. Participants regress to slow, dysfluent, early-stage reading behavior as they learn to crack the alphabetic code. They realize how much they need processing time to suppress the impulse to guess at words on the basis of sentence context, and why new information must be presented at a measured, appropriate pace to avoid overload.

Thus sensitized to their students' needs, teachers are given considerable time to learn the speech sound system of the English language and the multiple graphemes that are used for spelling. We have found that a whole course on the basics of phonological processing and the written alphabetic code is advisable. Once armed with insight about spoken and written language and how print maps to speech, the teacher can then be asked to interpret the student's verbal and written behavior. For example, if the student leaves the "m" out of "jump", the teacher will know to ask the student to hold his nose to perceive the nasal segment. If the student spells "progect" for "project," the teacher can infer that instruction in the common root, "ject," is necessary. Phenomena such as coarticulation and its affect on word identity become more obvious. If the student writes "nachr" for "nature" the teacher can say, "Yes, that is what your mouth is doing; we all change the /t/ before /yu/, so don't be fooled when you spell!"

The error patterns in children's writing provide direct clues regarding the language structures they must be systematically taught. For example, inflection errors account for a large proportion of transcription mistakes in students' writing at the 4th grade level (Moats, Foorman, & Taylor, in press), probably because students are seldom taught to disambiguate the relationship between the endings' meanings, sounds, and spellings. If teachers know that the last sound in *dogs* is /z/, not /s/, they will confirm what students may already have discerned: that the plural has several sounds. Likewise, if they know that /t/ ends the spoken word "walked" and /d/ ends the word "hummed" they will be ready to systematically explicate this very

difficult concept for students by sorting past tense words by their last sound. Typically, however, teachers

cannot make sense of these phenomena for students unless they have been prepared to do so.

Higher level concepts about language that are relevant to both assessment and instruction include etymological

features of words; the identification of schwa (the unaccented, indistinct vowel so common in Latin-derived words);

the relationship between a derivational suffix and the part of speech of a word to which it is added; basic grammatical

terms and role of a word in a sentence; and the organizing features of expository discourse.   We find repeatedly that

teachers have underdeveloped knowledge in all of these areas, but that when they are taught, they are both grateful for

the information and angry that they were not adequately prepared for entering the classroom.

Future Policy and Future Research

Multiple consensus reports, cited herein, link expectations for teacher knowledge to the scientific

consensus on reading instruction. The nature and substance of informed reading instruction and the need

for better pre-service training and professional development are concerns of many leading professional

organizations. The fruits of scientific reading research, however, cannot be realized unless teachers

understand and are prepared to implement those findings. Mandates for the practice of "scientifically based

reading research," such as those in the No Child Left Behind legislation of 2002, may have been premature

before a concerted educational effort was undertaken to ensure that teachers and administrators understood

what was intended.

Fundamental to differentiated instruction in basic reading skill is the teacher's insight into what causes

variation in students' reading acquisition and the ability to explain concepts explicitly, to choose examples wisely,

and to give targeted feedback when errors occur. Knowledge of language structure, language and reading

development, and the dependence of literacy on oral language proficiency are prerequisite (but not sufficient) for

informed instruction of reading. The better our field understands and documents what is necessary to enable teachers

to gain those insights and understandings, the better we will be at designing courses, evaluation tools, and training

regimens for teachers that are meaningful and effective.

We cannot blame teachers or hold them accountable for poor results if, as a profession, we have not defined

the prerequisite levels of verbal proficiency necessary to teach literacy, are unwilling to invoke standards for entry

into the profession, and have not offered teachers the kind of professional training that engages their interest, is

respectful of their concerns, and that empowers them to be successful with children (Foorman & Moats, 2003). Not

only do those who train teachers need to know the work of research, but also researchers must find more ways to communicate their findings to practitioners.

Meanwhile, these questions merit additional study, so that a strong case can be made for a different kind of teacher preparation: What combination and sequence of experiences are most effective and rewarding for teachers in training? How much content knowledge and verbal skill should be expected before teachers are even admitted to a licensing program? Within the confines of licensing programs, what concepts are most important to convey? What incentives will work best to improve the content and methods of teacher training? What is the difference between knowledge needed by specialists and knowledge needed by regular classroom teachers, and what is the difference in training time?

State and federal mandates for teachers to use screening and progress-monitoring assessments, to group children for instruction, and to teach reading and spelling explicitly would seem to be premature until teachers have been given more opportunity to learn the foundation concepts of their discipline. So far, the evidence suggests that classroom experience, use of structured reading programs, use of screening tests, and pressure for schools to improve are valuable but not sufficient to establish a more robust disciplinary knowledge base in the teacher corps. Teachers' disciplinary knowledge, as with other professions, is likely to be acquired through a combination of formal subject matter study and ample opportunities to apply that learning. It is my hope that reading science tackles these issues with fervor in the next decade.

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Appendix

Teacher Knowledge Survey

Percentage of 139 licensed, practicing primary grade teachers who earned correct scores on the item is in parentheses to the right. Correct responses are highlighted.

_____

Items 1-5: How many spoken syllables are in each word?   1.

nationality	1	2	3	4	**5**	(95%)
2. enabling		1	2	**3**	4	5	(48%)
3. incredible		1	2	3	**4**	5	(95%)
4. shirt	**1**	2	3	4	5	(87%)
5. cleaned		**1**	2	3	4	5	(695)

6. A syllable is: (50%)

   a. the same as a rime

   b. a unit of speech organized around a vowel sound

   c. a sequence of letters that includes one or more vowel letters

   d. equivalent to a morpheme

Items 7-12: How many phonemes or distinct speech sounds are in each word?   7.

straight	1	2	3	4	**5**	6	7	(33%)
8. explain		1	2	3	4	5	6	**7**	(1%)
9. lodged		1	2	3	**4**	5	6	7	(45%)
10. know		1	**2**	3	4	5	6	7	(68%)
11. racing		1	2	3	4	**5**	6	7	(13%)
12. eighth		1	**2**	3	4	5	6	7	(75%)

13. Which of the following words has a prefix? Pick one. (9%)

   a. missile

   b. distance

    c. commit

    d. interest

    e. furnish

14. Which of the following words has an adjective suffix? Pick one. (7%)

    a. natural

    b. apartment

    c. city

    d. encircle

    e. emptiness

15. Which word has a schwa (/∴/)? (55%)

    a. eagerly

    b. prevent

    c. definition

    d. formulate

    e. story

16. If a student spells the word "electricity" as "elektrisuty" which of the following is most likely

    true? (47%)

    a. The student does not know sound-symbol correspondence.

    b. The student has a poor ear for the sounds in our language.

    c. The student does not know the base word and suffix from which the word "electricity" was

    constructed.

    d. The student has a poor visual memory.

    e. All of the above.

17. The /k/ sounds in lake and lack are spelled differently. Why is lack spelled with ck? (52%)

a. The /k/ sound ends the word.

b. The word is a verb.

c. <mark>ck is used immediately after a short vowel.</mark>

d. c and k produce the same sound.

e. There is no principle or rule to explain this.

18. Why is there a double n in *stunning*? (50%)

a. <mark>Because the word ends in a single consonant preceded by a single vowel, and the ending begins with a</mark> vowel.

b. Because the final consonant is always doubled when adding –ing.

c. Because the letter u has many different pronunciations.

d. Because the consonant n is not well articulated and needs to be strengthened.

e. There is no principle or rule to explain this.

19. A student writes: "I have finely finished my math project." Her misspelling of the word finally most likely indicates that she: (42%)

a. is not attentive to the sounds in the word.

b. does not know basic letter-sound relations.

c. has <mark>not matched spelling to the meaningful parts (morphemes) of the word.</mark>

d. has a limited vocabulary.

e. has a limited knowledge of sight words.

20. Which of the following is a feature of English spelling? (10%)

a. A silent e at the end of a word always makes the vowel long.

b. <mark>Words never end in the letters "j" and "v."</mark>

c. When two vowels go walking, the first one does the talking.

d. A closed syllable must begin with a consonant.

e. All of the above.

Part 2 – True or False

21. Students must be able to orally segment and blend the phonemes in complex syllables before they can benefit from instruction in letter-sound correspondence. (F) (72%)

24. If a student is "glued to print", reading slowly word-by-word, the student should be told to read faster and to stop spending so much effort to decode. (F) (80%)

25. Screening at the end of kindergarten can be efficient, reliable, and valid for predicting a child's silent passage reading comprehension at the end of 3rd grade. (T) (39%)

26. The best remedy for a weakness in nonsense word reading is lots of practice reading nonsense words. (F) (65%)

27. Timed letter naming on DIBELS is a good risk-indicator for later reading comprehension. (T) (64%)

28. Phonological awareness exercises should always include letters or print. (F) (57%)

29. A closed syllable always begins with a consonant. (F) (36%)