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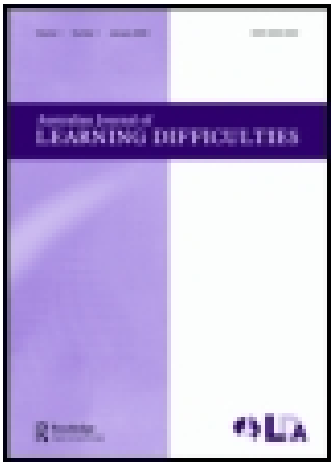

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What teachers don't know and why they aren't learning it: addressing the need for content and pedagogy in teacher education

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What teachers don't know and why they aren't learning it: addressing the need for content and pedagogy in teacher education

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This article discusses the lingering problem of poor and inappropriate preparation of professional teachers of reading and learning disabilities – why it exists and what we can do about it. Because most students classified as having learning disabilities experience primary difficulties with language-based learning, teachers must know how to teach the forms and processes of language on which literacy depends, but most teacher preparation programs fail to teach this content at a level that supports teachers' implementation of effective instruction. The evidence suggests that teachers may cling to unproductive philosophies of teaching not only because science-based instruction is neglected in many teacher training programs, but also because the requisite insights are elusive and the content is difficult for many to grasp, even with some exposure. While ideologies can be blamed for much resistance to explicit, systematic methodologies, we must ask why they develop in the first place. Although there is a substantial body of research on the relationship between teacher knowledge, practice, and student outcomes in reading on which to build reform in teacher training and mentoring, more thought should be given to how prospective teachers are taught. First, the disciplinary knowledge base required to teach students with reading and related difficulties must be unambiguously explained in the standards by which teachers are educated and evaluated, and then programs must be set up to build teachers' insight as well as their knowledge of basic reading psychology, language structure, and pedagogy. Those who teach teachers in university settings or who provide professional development must be included in a supportive educational process, as wars of ideology are having only limited positive effects.

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As the grateful and humble recipient of this year's Eminent Researcher Award from Learning Difficulties Australia, I must first confess that I am more teacher than researcher. My life's work, although it at times involved roles as Principal Investigator (PI) or Co-PI on research studies funded by the US National Institutes of Health, has included many years as a teacher, teacher trainer, and developer of materials for teacher education. I taught and worked as a "learning specialist" in clinical settings for about 10 years before enrolling in a doctoral program and taking my first course in the psychology of reading from Professor Jeanne Chall (Chall, 1989) at Harvard and before studying *Introduction to Language* from Professor Carol Chomsky.

None of my courses in learning disabilities at the master's level, and none of my elementary education courses, had addressed either the structure of language or the psychology of learning to read. None had provided me with theoretically sound perspectives that made sense in explaining good and poor reading, and I was unable to see

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what was confusing to my students or how to respond to them. I for years was unconsciously unskilled, although licensed with a master's degree and "specialist" title.

What I finally learned in my doctoral program permitted me to understand the necessity for explicit, systematic, structured language teaching, how it differed from language experience, whole language, and literature-based instruction, and why such instruction was necessary for students who were not wired to read. Determined that other teachers should be better prepared, I began to teach in schools of education, and found, of course, that my student–teachers were, as predicted, uneducated about language, reading acquisition, or reading disabilities. I devised courses in language and literacy to teach graduate students, but then found that the special education department at my university would not require the courses because the state's teacher licensing regulations did not evaluate candidates on their knowledge of this content. Eventually, priorities shifted, but only after many years of petitioning by students who had taken the courses.

Meanwhile, I devised a survey of teachers' knowledge of English language structure at the word level – imperative for informed teaching of word recognition and spelling – and reported the results in *Annals of Dyslexia* (Moats, 1994). The paper argued that although teachers should be able to teach explicitly many aspects of language that were integral to reading and writing (phoneme awareness, phonics, morphology, syntax, etymology, etc.), they themselves had a poor grasp of the concepts; indeed, most admitted readily that they were ill-prepared to explicate concepts of language structure to students who did not learn them easily, naturally, or through exposure alone (Moats & Lyon, 1996). I argued for a fundamental change in the teacher preparation curriculum, with more emphasis on language, psychology, and explicit teaching and less emphasis on education history, philosophy, self-reflection and agnostic surveys of existing methods. Much to my great surprise, the American Federation of Teachers (AFT) picked up the article for reprinting in its influential journal, *American Educator* (Moats, 1995). A few years later, the AFT sponsored publication of the paper, *Teaching Reading is Rocket Science* (Moats, 1999).

Many colleagues joined the effort to document teachers' inadequate content knowledge, producing a series of studies illuminating the knowledge gaps of general and special education teachers whose primary job is teaching reading and writing (e.g., Bos, Mather, Dickson, Podhajski, & Chard, 2001; Carlisle, Correnti, Phelps, & Zeng, 2009; Cunningham, Perry, Stanovich, & Stanovich, 2004; Mather, Bos, & Babur, 2001; Spear-Swerling & Brucker, 2003), exploring why those gaps exist, and examining the relationships among teacher knowledge, practice, and student learning. Out of this literature have emerged some complex themes that merit close examination if we are to gain more influence on educational policies and practices affecting students who struggle to read and write. The remainder of this paper has three objectives: (1) to illustrate in greater detail why, and at what level, knowledge of language and cognition is a professional necessity; (2) to draw inferences from my own and my colleagues' work regarding the barriers to change; and (3) to inform the Australian professional community about several initiatives in the USA that might inspire similar initiatives in Australia.

Why knowledge of language and cognition is necessary for teachers

Children's incoming levels of specific reading-related skills are the best predictors of future reading ability (Olson, Keenan, Byrne, & Samuelsson, 2014), but effective instruction that builds foundational insights about print and its meanings enables individual teachers and schools to "beat the odds" (Denton, Foorman, & Mathes, 2003; Foorman et al., 2006; Torgesen, 2004). Especially when the instruction explicitly teaches

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students how the alphabetic system works, builds skill incrementally and synthetically (linguistic elements to whole words), and provides sufficient practice for students to gain automaticity, poor readers can improve significantly (Blachman et al., 2004; Brady, 2011).

Although reading disability may be caused by a complex mix of genetic and environmental factors (Elliott & Grigorenko, 2014; Hulme & Snowling, 2009), intervention studies are consistent in supporting the efficacy of explicit, systematic, language-focused instruction, regardless of the presumed origin of the disability. Current research emphasizes the mixed nature of most language-based reading disabilities, the changing nature of reading disability over time, and the fallacy of single-solution approaches such as isolated training in phoneme awareness, singular focus on phonics, or fluency practice that excludes other essential components of instruction (e.g., Adlof & Perfetti, 2014; Elliott & Grigorenko, 2014; Perfetti, 2011; Vellutino, Tunmer, Jaccard, & Chen, 2007). What should vary in informed teaching is the instructional time, depth, and sequencing of activities aimed at building skill in phonology, phoneme-grapheme correspondences, spelling, morphology, word meaning and use, syntax, and/or discourse comprehension (Calhoon & Petscher, 2013; Calhoon, Sandow, & Hunter, 2010). Instructional priorities, in turn, should depend on the nature of the student's difficulties and his/her point of progress on the continuum of reading development.

A well-prepared teacher, then, must have a solid grasp of both the complexities of English orthography and the language systems that print represents in order to teach students recognition of written words. Without such knowledge, the teacher is likely to promote guessing strategies ("What might make sense here?"), bypass strategies ("Skip that and go on."), the belief that accuracy does not matter ("Nice try."), or rote memorization of higher frequency words. To teach text comprehension, the teacher needs substantial preparation in how to teach word meanings, sentence structures, referential and cohesive aspects of text, and overall text organization. Without that background, teachers are much more likely to rely on formulaic comprehension strategy approaches, reading aloud or passage rereading as a substitute for teaching students how to interpret the text, or discussion of the content of the passage without attention to the manner in which meaning is conveyed. Even if they use one of the many well-designed and scripted intervention programs, teachers must rely on background knowledge of their own to tailor lessons for individual students. The following three aspects of individualization, and the insight they require, can serve to illustrate how knowledge of language can inform teaching.

Interpreting errors and designing corrective feedback

Suppose an 8-year-old student, while writing to dictation, writes WOCD for walked, TRANDED for trained, and WONTER for wanted. The consistency of confusion about the past tense inflection should signal to the teacher that careful, incremental teaching will be necessary before the student will consistently spell this apparently "simple" grammatical element. But teaching this concept is more complex than it might appear on the surface. Learning to use the past tense in spelling requires attention to meaning, morpho-syntax, orthography, and phonology. First, the student must learn that the English regular past tense has three pronunciations (/t/, /d/, /əd/) that are governed by the properties of the final phoneme in the base word. A base word ending in a voiceless consonant such as /s/ (kiss) adds the voiceless /t/ as the spoken form of the past tense (kissed). A base word ending in a voiced consonant or vowel such as /m/ or /ou/ (hum; vow) adds the voiced /d/ for the past tense (hummed, vowed). And base words ending in /d/ or /t/ add the syllable /əd/ (wanted, ended). The spelling "ed" looks like a syllable but in most instances is not pronounced as a

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syllable; it is a stable morpheme preserved in orthography to convey meaning. To explain this ubiquitous inflection so that it makes sense to the learner requires reference to consonant/vowel distinctions, voicing and devoicing of consonant phonemes and vowels, reduction of the vowel in /əd/ to schwa, syllabification, and morphemic analysis. The past tense is linguistically complex, and for those who have limitations in linguistic awareness, must be learned gradually along with the prerequisite underlying concepts of language structure. Even then, persistent errors on inflections are very common in the writings of students with underdeveloped language skills (Moats, Foorman, & Taylor, 2006).

Ordering of concepts and choosing an approach

An 8th grade student, with IQ in the mid-average range (96), has a severe reading disability (1st %ile). He reads *bick* for brick; *fish* for flesh, *pern* for prop, *flake* for fake, and *bove* for brave. The student is unable to read the words *drove, flake, globe*, and *crime* in a list. When asked to segment spoken words into phonemes, the student is unable to orally segment words such as "blot", "trip", or "treg" and treats each as if it has three phonemes, unitizing the consonant blends. Given the student's underlying phonological disability and the revelation that no phonological skills were ever addressed in prior instruction (the school had been pursuing a "whole language" approach, to bypass the student's weaknesses), a remedial specialist would have to choose: What first? What next? With what method? Do I even try to address this problem? Can this student learn to read? These decisions are difficult, but must at least be informed by awareness that reading and spelling words with blends is more challenging than reading words with single consonants; that the phonemes /l/ and /r/ are particularly problematic for students with phonological disabilities; that accurate reading and spelling requires the ability to identify all phonemes in a syllable; that phonological awareness can be improved by multisensory techniques wherein the articulatory feel, mouth shape, and sound of a phoneme is emphasized (Ehri, 2014; Liberman, 1999); and that inclusion of encoding activities in the lesson is more likely to result in progress than phoneme awareness or decoding only (Weiser & Mathes, 2011).

Seeing opportunities for language instruction presented by text

Referents and cohesive devices can be missed by students who are laboring to decode words or who are not attending closely to meaning. If the text says, "Firefighters who fight wildfires often set backfires to clear the terrain. They can create a dangerous inferno," an alert teacher might pause and ask, "What does the word 'they' refer to?" The question would be motivated by knowledge that poor comprehenders fail to process cohesive and referential aspects of text, including pronoun references (Cain & Oakhill, 2012; Oakhill & Cain, 2012). If the text uses figurative language ("button your lips") or idioms ("she froze in her tracks") to express ideas, the teacher might pause to ensure that students can paraphrase the non-literal meanings. If the text says, "Barry, who had refused to play after he had been offended by David, failed to take his position," the teacher might pause to ask who had offended whom. Passive voice, long sentences that split the head noun from the main verb, and many other syntactic landmines interfere with text comprehension, so the informed teacher must be vigilant in helping students monitor whether they are understanding or not. Rarely does any teacher's manual anticipate the enumerable ways that students misinterpret what is intended; there is no substitute for a teacher who recognizes what is challenging about the words and what might be done to explicate the meanings.

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What, then, would an informed teacher of students with reading difficulties know and be able to do? In teaching word-level reading, the professional should be prepared to explain a word from any of several angles: the history of the language; morphology (inflections, prefixes, roots, derivational suffixes, compounds); phoneme-grapheme correspondences; position-based constraints on those correspondences; orthographic rules peculiar to English, such as the syllable spelling conventions; and occasionally, syntax and word use (Moats, 2010; Snow, Griffin, & Burns, 2005). Further, the teacher should be able to select and use – if not design – a logical pathway through this maze of information. The system of symbolic representation in English – or any alphabetic orthography – consists of categories of elements with properties and features; any single element can be understood in relation to others. An element can be talked about and understood in relation to the whole, and as Willingham (2006) has pointed out, students are much more likely to remember something they have thought about and that makes sense. Many popular methods and programs claim to have a phonics component but lack a scope and sequence that covers the full range of patterns in English orthography. Further, they often fail to make sense of the linguistic concept being taught, instead treating the whole subject of the written code as a hodge-podge of unrelated bits of information. In some, phonics is presented as bitter medicine, to be taken in small doses and appealed to as a last resort. Incremental teaching is impossible, however, without a defined, logical, and comprehensive roadmap of the content, and it is this coherence of subject matter that is so often missing in programs, textbooks, and teacher education courses.

For the subject of language to be taught coherently, all layers must be considered in sufficient depth for the teacher to manage word recognition, text comprehension, and written expression problems. While teaching comprehension, the teacher should, for example, be able to examine the text at hand for aspects of form and structure that poor comprehenders might not understand, and design the lesson in response to the challenges presented by the text. Not only would direct teaching of key vocabulary be necessary, but also direct teaching of cohesive devices, transition words, academic syntax, and text organization.

To integrate all of the essential instructional components named in the National Reading Panel report (National Institute of Child Health and Human Development, 2000), as well as writing and oral language use, a teacher should appreciate the interdependencies of these components. For example, vocabulary learning is facilitated by phonological awareness (Ehri, 2014; Perfetti, 2011), and students' ability to write is related to proficiency in using phonic word attack strategies and to manipulate a writing implement (Berninger & Wolf, 2009). Language processing is the "unitary construct" underlying the acquisition of reading skill (Mehta, Foorman, Branum-Martin, & Taylor, 2005; Perfetti, 2011); therefore, the effective teacher will be able to address all dimensions of language learning – or at least recognize that cross-referencing word form, meaning, and use is a purposeful enterprise.

If this characterization of the professional knowledge required to teach literacy makes sense so far, then the next most obvious question to ask is why so few teachers have this level of expertise.

Barriers to progress

Institutional shortcomings

The first answer, in the USA at least, is that scientifically grounded concepts of reading acquisition and information about language structure are not taught in the majority of

teacher preparation institutions. The National Council on Teacher Quality (NCTQ; www.nctq.org) in its recent review of over 1000 teacher training institutions (Greenberg, McKee, & Walsh, 2013) found that only 29% of the institutions required coursework pertaining to four or five of the five essential components of instruction identified by the National Reading Panel (phoneme awareness, phonics, fluency, vocabulary, comprehension). The majority of schools – 59% – addressed two or fewer of those components – taking into consideration all relevant courses offered by the institution. Even more disappointing, 78% of the schools were deemed inadequate in preparation for teaching "struggling readers" – a non-specific term that includes students with learning disabilities.

There are many reasons why coursework for teachers has remained impervious to scientific evidence regarding the nature and treatment of reading disabilities. The gulf between science and the educational philosophies held by many faculty members in schools of education is discussed in detail by Seidenberg (2013). Beginning with a review of historical influences on education in the USA, Seidenberg accurately portrays deep differences between the cultures of reading science and reading education, the anti-intellectual and anti-science bias in our schools of education, and the destructive, enduring influence of mis-placed constructivist ideas that continue to have a firm grip in reading and literacy education. He is correct that teachers learn mainly about values or ideas such as multi-culturalism, text characteristics (Level A, M, or Z?), and vaguely defined "literacy practices," and are taught to rely on intuition, self-reflection, personal experience, and anecdotal evidence as they develop their teaching habits. Many are actively taught to be suspicious of scientific research.

Another reality, moreover, must be brought to light to understand why teachers are not equipped to teach reading. In a brave study published in a leading scientific journal, Binks-Cantrell, Washburn, Joshi, and Hougan (2012) compared university faculty members' responses to those of their students on a survey of language and reading knowledge. Overall rates of correct responses were startlingly low among the university faculty who were responsible for teaching teachers how to teach reading. For example, only 15% were familiar with the five essential components of reading named in the National Reading Panel report. Only 29% knew that "frogs" has two morphemes, and only 26% knew that "observer" has three morphemes. Only 58% recognized the correct definition of phoneme awareness from multiple choice items, most often confusing it with phonics. Only 65% recognized a word (napkin) with two closed syllables. On every item of the survey, student teachers scored less well than their professors, as might be expected. The authors named this the "Peter principle" – which states that one cannot give to others what one does not have oneself.

Absence of incentives for practicing teachers to change

In a recent study of the impact of professional development on working first grade teachers, Brady et al. (2009) found that experienced teachers came into their study knowing no more about reading and language than novice teachers, as measured on objective assessments. This finding suggests that teachers do not learn how reading works just from being exposed to reading programs or from spending years in the classroom. The underlying psychological mechanisms of reading acquisition are not self-evident, and the fact that some students learned to read easily lead teachers to attribute other students' reading failure to anything other than the instruction they were providing. Further, some of the most experienced teachers tended to be the most skeptical of Brady's professional development project and the most inclined to reject information about explicit teaching of

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language structure if it challenged their prior beliefs. In the experimental schools, there was no established process for evaluating teachers on their ability to implement the evidence-based practices they were being taught. Similarly, the more eager participants who obtained better results, did not receive either monetary rewards or professional recognition for the quality of their work. The teachers who chose to adapt did so entirely for the intrinsic reward of getting better results with students and for believing that the researchers had something important to teach them.

Ubiquitous misinformation

A clear obstacle to improvement of the disciplinary knowledge base for reading instruction is the dearth of good textbooks and teaching materials for teacher preparation and professional development. Walsh, Glaser, and Dunne-Wilcox (2006), in the first NCTQ survey of reading courses, found that the most popular texts used in reading courses failed to address the five essential components of instruction identified by the National Reading Panel. Any information provided about language and reading research was skimpy or inaccurate most of the time. Joshi, Binks, Graham, et al.'s (2009) study of textbooks echoes and elaborates those findings. Not only do the most often-used textbooks in reading fail to explain the essential components of research-based instruction, but also outright misinformation about the findings of research on reading acquisition, the nature of English orthography, and the difference between phonology and phonics are found in the majority of texts.

Spencer, Schuele, Guillot, and Lee (2008), for example, reported that the instructional materials used by the teachers in their study contained many errors of linguistic analysis. The word *ox* was identified as having two phonemes (it has three, /ŏ/ /k/ /s/) and *off*, *on, olive*, and *one* were identified as beginning with "the sound for the letter o," although these words begin with the phonemes /au/, /ŏ/, and /w/. Details matter; with such inaccuracies, both teachers and their students may conclude that the orthographic code is nonsensical.

More specialized concepts about language that are seldom taught but that are also 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.

Surprisingly elusive concepts

Research accumulated to date shows unequivocally that teachers, even those who are experienced or those who specialize in learning disabilities, often are unaware of or misinformed about the elements of language that they are expected to teach explicitly. Concepts such as phonemes, graphemes, syllables, morphemes, basic parts of speech, sentence structures, and narrative or expository discourse organization are the meat and potatoes of explicit, systematic instruction, yet teacher education programs do not routinely own responsibility for ensuring that practitioners know what's what, or why any of this is important. That reasonably bright, literate professionals as a group seem either indifferent or outright hostile to the importance of this content continues to be puzzling.

On one hand, terms such as phoneme awareness and morphology appear in widely disseminated documents such as the Common Core State Standards (CCSS) adopted by the majority of the USA. On the other hand, few people understand what those terms

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mean. Spencer et al. (2008), reported that "the phonemic skill level of the reading and special education teachers was not sufficient to provide accurate phonemic awareness intervention . . . " and "many teachers had specific misconceptions about speech and print (p. 517)." For example, only 55% of teachers accurately indicated that the word *stop* has four phonemes, even though this item was one of the easiest on the survey of teachers' ability to segment words into their phonemic constituents. Spencer concluded that "effective training must help educators to thoroughly understand that speech maps to print (and not the reverse), to analyze speech without reference to print, and ultimately, to think clearly about how speech maps to print (p. 518)", because gaps in understanding were so pervasive. What does seem obvious after studies like Spencer's and others' (Fielding-Barnsley, 2010; Washburn, Joshi, & Binks-Cantrell, 2011) is that literate adults have forgotten what was involved in learning to read. The skills they employ as fluent readers are unconscious and beyond introspection; they have lost the ability to reflect on speech independently from print, and reconstruct what was involved in learning the alphabetic code.

In addition, educators may assume that anything taught in kindergarten or first grade, or at a foundational level for poor readers, should already be known to them because it is part of the early elementary curriculum. Therefore, they do not believe that study of orthography, for example, could be a richly rewarding experience that would enable them to explain any printed word to their students. In our new national Common Core standards, the foundational skills of reading literally are given a back seat to comprehension, placed toward in the rear of the document. The topic of foundational writing skills is not treated at all, and the topic of "language" is divorced from both reading and writing. No wonder educators come to believe that they already know what is necessary to teach students how to read, and that good teaching is focused almost exclusively on "close reading" of complex text, regardless of the student's level of readiness.

Ironically, research indicates that educators who understand the least about the details of the alphabetic system may be the most hostile to learning more about it – possibly because the need to know, again, is not self-evident to a fluent reader. Cunningham, Zibulsky, and Callahan (2009) documented that preschool teachers tend to overestimate their knowledge of phonological skills, the alphabetic principle, phonics, and early reading acquisition in relation to objective assessment. Cunningham's group (Cunningham et al., 2004) had previously shown that elementary school teachers did not accurately calibrate their knowledge in relation to the results of objective assessments. Teachers with higher levels of awareness of language structure tended to underestimate what they knew, whereas teachers with lower levels on objective measures tended to overestimate what they knew.

The inaccurate self-assessments may also diminish teachers' receptivity to learning more about the "technical" aspects of their discipline. Cunningham et al. (2004) reported that first grade teachers' priorities and preferences in beginning reading instruction typically did not conform to models substantiated by current research. Even special education teachers did not favor intensive code-based instruction for students at risk. Teachers with more knowledge of the orthographic code were somewhat more inclined to spend time teaching phonics, but overall, the content knowledge of first grade teachers was relatively low and the teachers preferred to spend their time on literature-based activities and independent reading and writing.

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Insufficient time allotted to foundational content in teacher training courses

Courses provided in teacher training programs are often insufficient in content and design to enable students to learn the subject matter and apply it to the teaching of reading (Walsh et al., 2006). Even when courses are well designed and focused on teaching substantive understandings of reading psychology and individual differences, the few hours allotted to the study of language, language-based learning, and instruction may not be enough to enable prospective teachers to achieve high levels of mastery (Spear-Swerling, 2009; Spear-Swerling & Brucker, 2003, 2004). As Cunningham et al. (2009) reported, teachers learn at different rates and often begin their coursework or professional development with inaccurate ideas about how much, and what, they should learn to be effective in the classroom. Many need direct feedback about the differences between their actual knowledge and what they believe they know. Some will need much more time to learn concepts that are abstract and inaccessible than survey courses allow. Many, like their students, have poorly developed phonological skills that must be bolstered through considerable practice. Very few come into teaching with appreciation for scientific inquiry and how research can inform their practice. A response-to-intervention model makes sense for teachers, too, wherein formative assessments and progress-monitoring tools are used to inform teachers about their attainment of content mastery, and extended learning opportunities are available for those who need them.

McCutchen et al. (2002) and McCutchen, Green, Abbott, and Sanders (2009) have been among those researchers able to demonstrate how much time it takes to impart the necessary understandings to teachers of beginning reading. McCutchen's group, in the first study, measured kindergarten and first grade teachers' knowledge and the relationship of growth in that knowledge to student outcomes. Teachers' (n=44) initial grasp of terminology and concepts in early reading instruction was very low in comparison to what the researchers expected. However, researchers also demonstrated that their 24 teachers in the experimental group could significantly improve if sufficient time was devoted to filling in the gaps in their professional knowledge base. In this case, an intensive 2-week summer institute followed by monthly seminars through the year produced gains in teachers and corresponding gains in their students, across a range of outcome measures.

During the 2-week summer institute, the instructors dwelt on the difference between the English spelling system and the speech sound system, 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. Teachers 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 control or account for teachers' choice of instructional materials once they went back to the classroom; rather, the 24 participating teachers used varying tools in their K-1 classrooms.

One year of monthly follow-up meetings and school visits from mentors was necessary for teachers to translate the information into practice. Ultimately, students in the experimental teachers' K and first grade classes obtained significantly better results than comparison students on measures of 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; first 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 enhances the effectiveness of their teaching. This approach, focused on the underlying knowledge for successful implementation, worked as well for the teachers of struggling students in grades three through five (McCutchen et al., 2009).

Spear-Swerling and Brucker (2003, 2004) investigated the relationship between novice teachers' word structure knowledge and the progress of second grade children tutored in a clinical setting. 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 instruction during the course was not sufficient to bring all teacher candidates up to the ceiling of the test. In a 5-year study conducted in high poverty, urban schools (Moats & Foorman, 2008), we spent at least 30 hours of workshop time on *each topic* – phonology, phonics, vocabulary, comprehension, and writing – ultimately to the significant benefit of participating teachers and their students.

As we continue working with practicing teachers across the country, we consistently find that the most elusive concepts about reading and language that take the most time to teach are: (1) the distinction between speech sounds (phonemes) and the letters or graphemes that represent them; (2) the ability to detect the identity of phonemes in words, especially if the spelling of a word does not bear a transparent relationship between phonemes and graphemes; (3) knowledge of orthographic patterns in English, such as the rule that no word ends in plain "v"; (4) conceptualization of functional spelling units such as digraphs, blends, vowel teams, and silent-letter spellings; (5) the conventions of syllable division and syllable spelling; (6) the identity of phrases and clauses in sentences; and (7) the organization of narrative and expository texts. Of course all of this information can be taught to teacher candidates and to practicing teachers, but once-over-lightly treatment is not sufficient to prepare anyone for the challenges of teaching literacy to students who lack aptitude for easy processing of written language.

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Is positive change possible?

It has been 20 years since I first wrote about the obvious: that intervention specialists, along with our general education colleagues, are often poorly prepared to understand the scientific foundations for good and poor reading and writing. In many teacher preparation programs, at least in the USA, there are no courses on the psychology of reading and cognitive development, on language acquisition, or the structure of language, spoken or written. The language differences that characterize students of more and less educated families, or of English learners, are seldom studied at a level that allows teachers to compare and address differences between indigenous language and academic English.

Adoption of the CCSS in the USA has not been helpful in this regard. Presently the target of much discussion and political manipulation from both the political left and right, the Common Core was intended to provide all 50 states in the USA a common set of academic goals at each grade level that would promote richer curricula and rigorous teaching comparable with other advanced societies. The intention was commendable, but

the document itself obscures the important relationships between language, reading, and writing, and between lower level (foundational) and advanced reading and writing skills. In addition, implementation so far has marginalized students in the lower end of the academic spectrum, including the less privileged and students with learning disabilities, and directed teachers away from explicit, systematic skill-building. As a consequence of our national anxiety about unflattering international comparisons, teachers are being asked to give their students harder texts to read and more challenging writing assignments, regardless of whether those students have the prerequisite skills to be successful. This turn of events is another sign that the education community, let alone the general public, has not grasped what is involved in learning to read and why so many students struggle to become literate. We have a long way to go before reading science goes mainstream.

Not all is lost, though, as there are a few very positive initiatives to promote and improve teacher preparation in the area of reading difficulties.

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Higher education consortia

Texas led the way in establishing a higher education consortium to improve and update university course content in reading (Higher Education Collaborative, 2006). Supported with a combination of state and university funds, faculty who teach reading courses were invited to participate in a cooperative effort to improve their courses' alignment with research. Several 100 course instructors voluntarily joined in the effort to share syllabi, textbooks, and ideas for assignments. The consortium has produced tangible improvements in the content and requirements of general and special education coursework related to reading instruction (Joshi, Binks, Hougen et al., 2009). Student teachers prepared by faculty members who have participated in the Collaborative have been shown to obtain better student outcomes than instructors from non-participating programs (Binks, 2008; Binks-Cantrell et al., 2012; Joshi, Binks, Hougen, Dean, et al., 2009). Other states (and international communities) might consider replicating this model, which includes several face-to-face meetings yearly, consultation from researchers, and an active series of web-based exchanges among participants.

One dilemma in formulating an approach to teacher training is how to challenge the established schemas of educators who believe that learning to read should be easy or natural, and who are ready to blame parents, cultures, poverty, or laziness for students' failure to read. In our ongoing work with teachers, we take time initially to build insight and empathy with a "learning to read" exercise that requires participants to learn a novel symbol system. In the process of learning to read the unfamiliar code, participants regress to slow, dysfluent, early-stage reading behavior as they learn the new alphabet. This "experiential learning" episode is then followed by explicit teaching of basic theoretical frameworks that explain word recognition and its relationship to language comprehension, such as Perfetti's (2011). We build empathy by drawing analogies between learning to read and learning to play music, produce graphic art, or excel at athletics, endeavors in which individual aptitudes and motivation, genetic predispositions, and learning opportunities are readily understood by most.

We also find that it is important to validate teachers' prior beliefs about literature-based instruction as appropriate for students who learn to read easily and naturally (often students who are just like them). Teachers will be less defensive and more open if we emphasize the range of individual aptitudes for reading and ask them to gather data on children's basic skill levels very early in their training. Some need to see many examples of students who cannot spell or read short vowels, consonant blends, vowel teams, or

multi-syllable words before they are convinced that reading must begin with the basics. Finally, we use quizzes liberally throughout our workshops and courses, but always with the promise that we will teach teachers anything they do not fully understand. In consortium settings, we often share responsibility for generating test items – itself an activity that promotes more attention to detail and wider discussion of the knowledge base for teaching.

Ranking of institutions by the NCTQ

The independent NCTQ has for the first time conducted and published rankings of teacher preparation programs across the USA. Although these rankings are based on a very broad set of criteria that extend to practicum requirements, admission standards, and overall expectations, instruction in reading (for both general education and special education programs) is evaluated on the basis of its alignment with scientific research. Programs that are built around promotion of Reading Recovery and related materials, for example, are given low scores. Of course the ranking of programs is controversial (especially among the university faculty!), but has produced a lively national discussion and greater awareness among funding sources, policy makers, and the general public of just how much – and in what way – the teacher preparation programs must improve.

Adoption of knowledge and practice standards for teachers of reading by the IDA

The International Dyslexia Association (IDA) formed a committee in 2009 to establish knowledge and practice standards for teachers of reading. The IDA board had determined that existing sets of standards, notably those already generated by the International Reading Association and the Council for Exceptional Children, lacked specificity, clarity, scientific grounding, and were insufficient to guide the preparation of teachers working with reading difficulties. The *Knowledge and practice standards for teachers of reading* (IDA, www.interdys.org) were deliberately titled to address the preparation of *all* teachers of reading, but the more advanced skills of a specialist were identified as well.

Following the adoption of the *Knowledge and practice standards*, IDA invited teacher preparation programs to volunteer for accreditation reviews. Reviews of syllabi, evaluations, assignments, practicum requirements, and any other evidence bearing on the program's alignment with the IDA standards were conducted by independent teams. To date, after two rounds of reviews over the past 3 years, 18 teacher certification programs have received IDA's seal of approval. Accredited programs range from those in a large state university to those in small, private, specialized schools. Institutions who have been accredited report a significant increase in applications from qualified candidates who are seeking substance and value in their training program. The "value added" approach is also stimulating wider interest in accreditation both nationally and internationally.

Also in the works is the development of a certification exam whose content is explicitly aligned to IDA's *Knowledge and practice standards*. This examination should serve as an internationally recognized measure of a teacher's qualifications to work with students with reading difficulties. With aligned coursework, a meaningful professional examination, and clear practicum requirements for specialists, we should be able to establish consistency in the definition of "professional teacher of reading."

To conclude, beginning with my own experience as a teacher, I and many colleagues have documented that both regular classroom teachers and specialists are often unprepared to carry out effective instruction with poor readers. We have verified that teacher

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preparation programs often fail to equip their candidates with knowledge of language structure, knowledge of scientific concepts of reading acquisition, or familiarity with scientifically grounded theories of individual differences in learning. Further, we have exposed the "Peter principle" – that teachers in training cannot learn what their faculty instructors do not know themselves. As a consequence, teachers often report feeling unprepared to work with students who struggle to attain reading and writing skills.

If the remedy for this problem were policy-driven mandates that courses and workshops include the requisite content, however, we might not have continuing controversies about the kinds of programs to deliver in schools, or large segments of the population who fail to learn to read adequately. States such as California and Massachusetts, for example, have long had clear curriculum standards that address the essential components of instruction. Yet in those same states, many students have low levels of literacy and many students with learning disabilities do not receive the instruction they most need. At this juncture, we have better insight into the barriers that prevent improvement in teachers' practices and that might help the field refine its approach to the training of teachers.

One lesson from existing studies of teachers is that experience and exposure have little bearing on what they understand about the students in front of them who are not "catching on." Therefore, experience is only moderately valuable in rating teacher effectiveness, and even experienced teachers should be asked to study and learn content they probably missed in their original training. Periodic, required professional examinations, aligned to clear standards for teacher knowledge, should be tied to continuation of training and advancement through the profession. Some aspiring individuals who want to teach reading to students with learning disabilities may not themselves have the linguistic awareness, verbal and reasoning abilities, or orientation toward research-based practices to continue in this role. We should advise them accordingly.

Second, we know that the adoption or prescription of well-designed instructional programs cannot compensate for a teacher who has little understanding of the content and methodology of the program (Piasta, Connor McDonald, Fishman, & Morrison, 2009). The quality of implementation of an instructional program has everything to do with its success. Quality of implementation, however, is greatly enhanced by mentoring and coaching by individuals who themselves are highly skilled (Carlisle & Berebitsky, 2011; Haager, Heimbichner, Dhar, Moulton, & McMillan, 2008). Even if the teacher knows what ought to be done, actually doing it (managing groups, using materials, pacing the lesson, and so forth) can be daunting for teachers. Unfortunately, current educational policies and funding practices continue to focus on texts and text difficulty, school organization, and student test scores – not teachers, the contexts in which they teach, or the leadership and continuous professional development required to ensure "teacher quality."

Third, we continually underestimate the elusiveness of the foundational content (phoneme awareness, phonics, grammar, spelling, text structure, and so forth) for adult teachers. Teachers often know little more than their students, especially about speech sounds in words, word structure, and its relation to meaning, the organization of orthography, or how to describe the parts of a sentence. None of us are born with these insights; we must learn a substantial amount of disciplinary content in order to help students understand what they are learning so that they can process text automatically. To compound the problem, teachers themselves overestimate what they know – unless they know a lot, in which case they underestimate what they know. Philosophical orientations also get in the way of practicing teachers learning more about what struggling students need from them. It seems that once a schema for the teaching of reading is established,

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either through a first course or through initial exposure to classrooms, it can be difficult to modify.

The adage, "telling is not teaching," applies to teacher education as well as to all else in schooling. Much of our energy is consumed by telling – that is, trying to get the right language and the best content into teacher training requirements, programs, textbooks, and workshops. We have expected that naming what we want will be sufficient to have it happen. We are still, however, in need of a science of how to teach the teachers, since "telling" has had only selective and modest effects. Perhaps more substantive evidence on some crucial questions might help our cause: What combination and sequence of experiences create the most indelible insights for teachers in training? What will engage them so that they persist with challenging students and advocate for them? How can teachers' prior beliefs be surfaced, discussed, and challenged (if necessary) in ways that engender cognitive shifts? How much metalinguistic awareness and verbal skill should be expected before teachers are even admitted to a training program? Within the confines of training programs, what concepts are most important to convey and in what order? What is the difference between knowledge needed by specialists and knowledge needed by regular classroom teachers, and what is the difference in training time? What kind of measures are valid for documenting professional competence?

Teaching reading and related language skills to students with learning difficulties is a complex task under the best of circumstances. To improve teacher quality and effectiveness, we must continue to argue that reading and writing instruction are content-laden teaching disciplines. In addition, we must get better at providing the kind of teacher education and professional development that results in knowledge of language and cognition, understanding of individual differences, and ability to implement effective practices. All teachers of reading should share a basic set of concepts with intervention specialists. Standards for knowledge and practice, meaningful training examinations with international credibility, informative textbooks and courses, expert mentoring, and greater rewards for those who demonstrate expertise are all areas in which we are making progress. A more robust science of teacher education in reading instruction should accelerate that progress in the coming decades.

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