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The Role of Wisdom in Evidence-Based Preschool Literacy Curricula

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Early Reading First, a portion of the No Child Left Behind (U.S. Congress, 2001) legislation, authorized \$245 million between 2002 and 2004 to develop “preschool centers of educational excellence” (2004 Application for New Grants for the Early Reading First Program, A-1). While the draft guidelines for Early Reading First for each of the three years of funding between 2002 and 2004 have remained the same, there have been two changes in the language of the requirements in Selection Criteria for the grants in 2002 versus 2004 which prompted the focus of this paper.

In both 2002 and in 2004, the Application for New Grants for the Early Reading First Program specified that Early Reading First grantees would use “language and literacy activities based on scientifically based reading research that supports the age-appropriate development of-

- Oral language (vocabulary development, expressive language, and listening comprehension);
- Phonological awareness (rhyming, blending, segmenting)
- Print awareness; and
- Alphabet knowledge (letter recognition) (for example, 2004, p. B-2).”

However, there were differences between 2002 and 2004 in the categories of Selection Criteria and in the language used within these categories. In 2002, grantees were evaluated on the Quality of Project Activities (or Services) where the level of early literacy achievement was not specified (see 2002, p. E-6). In contrast, in 2004 (in a Selection Criterion not included in the 2004 Quality of the Project Design) grantees were evaluated on their plan for insuring that children in the project would develop:

- (A) Recognition, leading to automatic recognition, of letters of the alphabet;
- (B) Knowledge of letter sounds, the blending of sounds, and the use of increasingly complex vocabulary;
- (C) An understanding that written language is composed of phonemes and letters, each representing one or more speech sounds that in combination make up syllables, words, and sentences;
- (D) Spoken language, including vocabulary and oral comprehension abilities;
- (E) Knowledge of the purposes and conventions of print. (Application for New Grants for the Early Reading First Program, 2004, p. E-10)

While the broad categories of oral language, phonological awareness, print awareness, and alphabet knowledge were still referenced in other places in the 2004 document (for example, B-12), grantees were evaluated on their attention to these more specified achievement levels.

In addition to the shift from more general expectations to higher and more specified levels of child outcomes, there was also a shift away from a call for “activities and services” to a call for using “the curriculum” to deliver instruction in 2004. The Quality of Project Design Selection Criteria in 2004 required applicants to:

Outline *the curriculum's* defined scope and sequence and describe how it is structured, systematic, and aligned to support the development of children's oral language, phonological awareness, print awareness, and alphabet knowledge. (italics added, p. E-10)

These two shifts prompted me to ask three questions which focus specifically on alphabet knowledge and phonemic awareness:

1. What level of alphabet knowledge and phonemic awareness is enough to prepare children for success in kindergarten?
2. What methods of teaching, materials, and activities have researchers found effective in teaching phonemic awareness and alphabet knowledge to three- and four-year-olds?
3. How well do early language and literacy curricula match conclusions about instructional goals and the methods, materials, and activities found to be effective in reaching those goals?

I focus on alphabet knowledge and phonological awareness for two reasons: (a) it narrowed my task to a (barely) manageable size; and (b) because it has been the topic of so much interest and controversy. I do not, however, want to imply that these two components of emergent literacy are more important, more crucial, or more central to the task of learning to read and write. In fact, oral language and comprehension are emerging as far more crucial than we previously have believed (Storch & Whitehurst, 2002; Dickinson, McCabe, Anastopoulos, Peisner-Feinberg, & Poe, 2003).

GOVERNMENT-SPONSORED REVIEWS OF RESEARCH: WHAT DO THEY SUGGEST?

In order to answer the first question, I first examined recommendations of the Committee on the Prevention of Reading Difficulties in Young Children summarized in *Preventing Reading Difficulties in Young Children* (Snow, Burns, & Griffin, 1998) in order to determine the level of alphabet knowledge and phonemic awareness we can reasonably expect in preschool. In the chapter titled “Preventing Reading Difficulties Before Kindergarten,” Snow and her colleagues reviewed three preschool phonological training studies. From this review they concluded, “It is clear that instruction in phonological awareness ought to be accompanied by training in letters and letter-sound associations also. Children who *enter school* with these competencies will be better prepared to benefit from formal reading instruction” (p. 154-55, italics added). One of the three phonological awareness training studies examined in their chapter included a 1989 study by Byrne and Fielding-Barnsley, although none of Byrne and Fielding-Barnsley's subsequent works (e.g., Byrne, 1992; Byrne & Fielding-Barnsley, 1990, 1991, 1993, & 1995) were discussed in this

chapter. The second study quoted in their chapter was an unpublished manuscript (Dorval, Joyce, & Ramey, 1980), and the third study was actually conducted in inner-city kindergartens (Brady, Fowler, Stone, & Winbury, 1994). To further complicate matters, in the chapter summary, the authors significantly altered the way they discussed letter and phonological awareness outcomes for preschoolers, they stated: “Ideally, . . . children [will] have acquired some specific knowledge of letters, [and] . . . some capacity to play with and analyze the sound system of their native language” (p. 170).

Next, I turned to *The Report of the National Reading Panel* (2000) for its recommendations on expected outcomes in preschool. In its section on “Alphabets,” the authors drew conclusions about levels of instruction in phonological awareness that are appropriate for different ages of children. They concluded that, “The reason to teach first-sound comparisons is to draw preschoolers' or kindergartners' attention to the fact that words have sounds as well as meanings. A reason to teach phoneme segmentation is to help kindergartners or first graders generate more complete spellings of words” (p. 2-31). First-sound comparisons involve selecting the names of pictures or spoken words that have the same initial sound--what Byrne and his colleagues (Byrne & Fielding-Barnsley, 1991) call phoneme identity and Bradley and Bryant (1985) call sound categorization.

Together these two large-scale, government-sponsored reviews of research suggested that children in preschool should begin the journey into learning the alphabet and acquiring phonological awareness. However, neither provided convincing evidence of how far that journey should take them, although the *Report of the Reading Panel* (2000) suggested a possible ending point for phonological awareness.

REVIEW OF THREE BODIES OF RESEARCH

Next, I examined three bodies of research in order to address my three questions:

1. Research which has described what preschoolers know and can do (descriptive studies);
2. Research which has examined what is critical for preschoolers to know (longitudinal studies); and
3. Research which has examined what preschoolers can learn to do (instructional or training studies).

The first body of research includes qualitative and quantitative studies describing young children as they engage in literacy activities in their homes or preschools. These included, among many: Barone's (1999) case studies of young children exposed to crack/cocaine; Fox and Routh's (1975) study of preschool children's ability to segment sentences into words and words into syllables and phonemes; Chaney's (1992) study of metalinguistic skills in three-year-old children; and Lonigan, Burgess, Anthony, and Barker's (1998) study of two- to five-year-old children's phonological sensitivity at different levels of linguistic complexity.

Several studies suggested that four-year-olds, especially from middle-income families, learn

a great deal about alphabet letters (e.g., Mason, 1980; Worden & Boettcher, 1990; Treiman, Tincoff, Rodriguez, Mousaki, & Francis, 1998). Treiman and her colleagues examined the knowledge of individual alphabet letters and letter-sound correspondences among 660 preschool children in three locations in the United States. Children in California assessed in the late 1980s knew a mean of 54% of the upper case letter names compared to preschoolers in Detroit assessed in the mid 1990s who knew a mean of 74%. Children knew fewer letter-sounds (in California a mean of 6 letter sounds and in Detroit a mean of 9). Thus, middle-class four-year olds typically knew a range of 14-19 upper case alphabet letters, fewer lower case letters (a mean of 10), and fewer letter-sounds (a range from 6 to 9) (Treiman et al., 1998; Worden & Boettcher, 1990).

While Treiman and Kessler (2003) argued that preschoolers learn letter-names from informal experiences, such as singing the alphabet song or reading alphabet books at home or in preschool, Bloodgood's (1999) research suggests another important pathway for the beginning of alphabet letter learning. Bloodgood studied the development of children's ability to recognize and write their name as well as their development of a variety of early literacy concepts. Her study showed that children's alphabet learning emerged later than, and was related to, their awareness and skill in recognizing and writing their name.

Numerous studies have demonstrated that preschoolers are capable of demonstrating various levels of phonological and phonemic awareness. For example, Lonigan and his colleagues (Lonigan, Burgess, Anthony, & Barker, 1998) found that 26% of two-year-olds, 14% of three-year-olds, and 39% of four-year-olds knew rhyme. In contrast, no two-year-olds could identify a word that began with a different phoneme from a set of three words, 9% of three-year-olds could do this, and only 34% of four-year-olds--all these children were from middle-income families. Only 10% of four-year-olds from low-income families could perform this task.

While this body of research documented the kinds of early conventional concepts related to language and literacy, and provided some information about the percentage of children who could complete the assessment tasks ultimately, it was not very helpful in answering the question of what level of alphabet knowledge and phonemic awareness is sufficient at the end of preschool to reasonably predict success in kindergarten. These researchers did not address either theoretically or empirically the level of knowledge that matters at kindergarten entry.

So, I turned next to examine longitudinal research intended to predict later reading and writing performance from earlier performance. These researchers search for variables that account for unique variance after variables such as verbal skills, IQ, age, and SES have been controlled. In preschool these included alphabet recognition, phonological awareness, name writing, and concepts about print and vocabulary. A classic example of this kind of research is Maclean, Bryant, and Bradley's (1987) study of the relationship between preschool children's knowledge of nursery rhymes and their later phonological development. Other examples include the work of Bowey (1995), Lonigan, Burgess, and Anthony (2000), Storch and Whitehurst (2002), and Muter, Hulme, Snowling, and Stevenson (2004).

Surprisingly, I found that predictor studies were quite uninformative in answering my question of how much phonemic awareness and alphabet knowledge is enough. To illustrate, the

following is a summary statement typical of the longitudinal studies I examined: "Our results are clear (a) in demonstrating the critical roles of phoneme sensitivity and letter knowledge for the development of early word recognition skills, and (b) in demonstrating that for reading comprehension, as might be expected, vocabulary knowledge and grammatical skills play additional significant roles" (Muter, Hulme, Snowling, & Stevenson, 2004, p. 679).

The only researchers, out of the many longitudinal studies that I read, who took a stance on how much alphabet knowledge and phonemic awareness ought to be expected in preschool were David Dickinson and his colleagues (Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003). These researchers were predicting the later reading and writing achievement of Head Start children and found these children had very low levels of preschool language and literacy development. They noted that the mean receptive vocabulary score for the children in their study was in the 19th percentile. Print and phonological skills for these children were similarly depressed. In contrast, they suggested that children who have experienced one or two years of preschool should have been able to recognize familiar environmental print words in context, discriminate words from non-words (letter, number, and symbol strings), write their name, and identify many alphabet letters. Similarly, they argued that children should have been able to produce rhyming words and delete ending sounds from words. While most of these recommendations seem reasonable, it is important to note that there is considerable controversy over whether the use of deletion of phonemes is an adequate measure of preschool phonological awareness. Blachman (2000), for example, concluded that "more complex manipulation of phonemes, such as is required in the deletion and rearrangement of phonemes in a spoken words, is actually the result of learning to read and spell" (p. 494) suggesting, as did *The National Reading Panel* (2000), that segmenting phonemes is more appropriate at the kindergarten and first-grade level where instruction in reading is provided.

Finally, I examined training studies, in which preschool children were taught alphabet letters, phonological awareness, or sound-letter correspondences, for further insights into how much alphabet knowledge and phonemic awareness can be expected in preschool. Two lines of research emerged as critical in addressing this question: the series of studies conducted by Treiman and her colleagues (e.g., Treiman, Weatherson, & Berch, 1994; Treiman, Tincoff, & Richmond-Welty, 1996, 1997; Treiman, Tincoff, Rodriguez, Mousaki, & Francis, 1998; Treiman & Kessler, 2003); and those conducted by Byrne and his colleagues (Byrne & Fielding-Barnsley, 1989, 1990, 1991, 1993, 1995, 2000; Byrne, 1998; Byrne, Fielding-Barnsley, & Ashley, 2000). However, before reviewing these two critical lines of research, I review a few phonological awareness training studies in which preschoolers reached awareness of phonemes, for reasons that will become apparent later in this paper.

Lundberg and his colleagues (Lundberg, Frost, & Peterson, 1988) taught Danish preschool children who were actually six and seven years old to manipulate words, syllables, rhymes, and finally phonemes. The gains children made in phonological awareness produced higher levels of reading and spelling in Grade 1. This groundbreaking study was replicated with five-year-old kindergartners in Germany (Schneider, Kuspert, Roth, Vice, & Marx, 1997), but not with

preschoolers. One innovative study conducted by Ukrainetz and her colleagues (Ukrainetz, Cooney, Dyer, Kysar, & Harris, 2000) showed how preschoolers and kindergartners were taught phonemic awareness embedded within shared reading. The teacher read aloud a book with several rhyming words and stopped every second page to help children identify two rhyming words, isolate each of their beginning phonemes, segment each of the words into phonemes, and count the number of phonemes. In a study using a more explicit approach, Justice and her colleagues (Justice, Chow, Capellini, Flanigan, & Colton, 2003) increased preschoolers' ability to segment phonemes during six weeks of game-like instruction. In both these studies, instruction was effective in improving children's phonemic awareness. It is not clear, however, whether this increase in awareness made a significant difference in children's reading and spelling because the children were not followed into kindergarten and first grade. Nonetheless, these studies demonstrate that it is possible for four-year-olds to become aware of phonemes and to manipulate them with teacher support.

Acquiring Alphabet Knowledge: The Legacy of Rebecca Treiman and Her Colleagues

Most of Treiman's long career has been devoted to uncovering the role that alphabet letter names play in literacy acquisition. In order to put her research into context, I return to 1975 when Richard Venezky published "The Curious Role of Letter Names in Reading Instruction." He reviewed several studies including those in which researchers taught children alphabet letters and then assessed their ability to decode words. For the most part, these researchers found no enhanced decoding resulted from merely teaching children to name the alphabet letters. Based on these and other studies conducted with adults who were taught to discriminate among shapes with or without learning names for the shapes, Venezky concluded, "a heavy emphasis on letter-name learning in either pre-reading or initial reading programs has neither logical nor experimental support" (1975, p. 19). Adams (1990) reached the same conclusion in her review of research. Thus, it is not surprising that we have had so few alphabet training studies in the last 30 years.

However, Treiman took a different route to investigating the role of letter names in literacy development. Rather than teaching children alphabet letters, she demonstrated, in a series of studies, how the alphabet name knowledge that children already had acquired influenced their performance on reading and spelling tasks. In one study (Treiman & Rodriguez, 1999) children were taught to read words with simplified spellings (like those used by Ehri and Wilce, 1985). Children learned to associate a word with each of the spellings. The word learned for the letter name spellings included the name of the letter in the word (BT for the word /bee/ /t/). The word learned for letter-sound spellings included letters associated with the sounds at the beginning and endings of the word (BT for the word /b/ ai /t/). The word learned for visually distinctive spellings included letters not associated with the word, but the letters were written in various sizes to make them more memorable (BT for ham).

Preschool and kindergarten children who could read no words at the onset of the study were able to learn to read the simplified spellings. They learned more words with letter-name spellings than either words with visually-distinctive spellings or words with sound-related spellings. Thus, Treiman and her colleagues concluded that children must be using their knowledge of letter names

to boost their word reading. In other studies Treiman and her colleagues demonstrated that children's letter name knowledge influenced their spelling (e.g., Treiman, Sotak, & Bowman, 2001; Treiman, Tincoff, & Richmond-Welty, 1996; Treiman, Weatherston, & Berch, 1994).

Treiman and her colleagues also demonstrated that knowing alphabet letter names plays a role in learning sound-letter associations. In one study (Treiman, Tincoff, Rodriguez, Mouzaki, & Francis, 1998), preschoolers were taught the sounds of 10 alphabet letters using paired associate learning methods. Children included in the study knew the names of the letters used in the training, but they knew few or none of their sounds. Three kinds of letters were included in the study: letters in which the sound normally associated with the letter is found at the beginning of the letter name (CV letters such as d and v); letters in which the sound is found at the end of the letter name (VC letters such as l and m); and letters in which the sound is not found in the letter name (other letters such as w and y). Children performed better with CV letters than VC letters, and better with VC letters than other letters. Treiman believed that the only way to learn to associate the letter shape with either its name or sound was through rote memory, and paired associate learning is the most effective method for helping people learn to associate two seemingly unrelated and non-meaningful items. Therefore, she argued that if children's performance was based on memory alone, then children should have performed equally well on all three kinds of spellings. They did not, and Treiman concluded that without any direct instruction, children were able to deduce relationships between letter names and sounds.

Share (2004) replicated this study with Israeli children who spoke no English (Share, 2004). Both Treiman and Kessler (2003) and Share concluded that children must be able to segment the sound out of the letter name. However, it could be that children notice that similar vocal gestures are used to say a letter name and its sound—something that Murray (1998) has argued. Nonetheless, these studies demonstrated that children first acquire knowledge of some alphabet letter names, followed by the ability to use this knowledge of specific letters to learn to spell, read, and discover letter-sound relationships. Once children have acquired some alphabet letter recognition, they can use this knowledge strategically in principled learning, particularly of letter-sound relationships, rather than relying on mere rote memory.

However, in summarizing what children must learn in order to first recognize alphabet letters, Treiman and Kessler (2003) stated that "rote memorization of shape-name pairs is the only option with languages like English, where the shapes of almost all letters are, from the child's point of view, arbitrary" (p. 119). Thus, she and her colleague argued that rote learning was the only pathway to learning to recognize alphabet letters by name. The way to increase the effectiveness of letter-name learning, they suggested, was to increase children's familiarity with the stimulus (the letter shape) or the response (its name), thereby increasing the speed with which children will memorize the pairing. Paired associative learning is the most efficient way to learn non-meaningful pairs, thus alphabet recognition instruction should capitalize on these techniques.

But is the stimulus, the letter shape, something that must merely be memorized? Gibson and her colleagues (Gibson, Gibson, Pick, & Osser, 1962; Gibson & Levin, 1975) demonstrated that children learned to discriminate among alphabet letters using an ever-increasing awareness of letter

features such as straight or curved lines, open or closed letters, and orientation. Murray (1998) suggested that learning alphabet letters might be learning alphabet identities, in which children learn the features that distinguish one category (e.g., C) from other categories (e.g., U) through example and non-example.

Thus, becoming familiar with letter stimulus (letter shapes) must involve learning about letter features so that the categories of different letters (for example, C and U) can be distinguished from one another. Researchers have shown that children learn confusable letters (letters which share features) later than less confusable letters (Treiman et al., 1998). Nonetheless, in order to learn the alphabet letter names, children must get past the obstacle of confusable letter features. I would expect that effective alphabet letter instruction would confront children with letter features. Children would examine or write examples and non-examples of particular letters, possibly talking about how the letter features are alike or different, in order to make letter shapes more familiar. I would argue that combining attention with letter features and discriminating confusable letters should be included as a part of paired associative learning techniques. Thus, I would expect that children would learn sets of 2-6 letters together because paired associate learning methods are more effective with a small number of pairings to be learned.

Now I turn to two recent studies in which researchers have taught children several early language and literacy concepts including alphabet letters. Roberts (2003) and her colleague (Roberts & Neal, 2004) taught preschool English Language Learners whose home language was Spanish or Hmong several early literacy concepts in two different treatment groups. Children in the letter-rhyme group learned to identify 16 alphabet letter names using a series of what I would call "table top" games during "letter of the week" instruction. These consisted of finding the target letter in a bag of letters and feeding it to a puppet, finding the letter in the children's names, matching letters, and writing the letter with teacher guidance. The children were also taught rhyming by listening to rhymes and jingles, judging whether words rhymed, matching rhyming words, and generating rhymes. Children in the comprehension group were introduced to a story a week, taught vocabulary from the story, and participated in activities which drew attention to story events, sequence, and vocabulary. The researchers argued that both of the instruction procedures were explicit. At the end of the sixteen-week instructional program, children in the letter-rhyme group learned more alphabet letters and children in the comprehension group learned more vocabulary. No other differences were found. In a similar study with more emphasis on rhyme and teacher-modeled fingertip reading, Roberts (2003) found that the letter-rhyme children learned more alphabet letter names whereas the comprehension group learned more vocabulary and concepts about print.

In both studies, the instruction in alphabet recognition proved effective. In the letter-rhyme treatment group, 58% of the children knew 13 or more of the 16 letters taught and the mean of the entire group was 11 out of 16 (Roberts & Neal, 2004). These researchers pointed out these children learned 50% of the alphabet names, a performance similar to what Worden and Boettcher (1990) found with middle class children. This seems remarkable given that all of the children in these two studies were identified as non-English speaking at the beginning of the instruction.

Other techniques for teaching alphabet letter recognition have also been successfully employed. Justice and her colleagues (Justice et al, 2003) taught low-income children, many with oral language difficulties, to recognize alphabet letters by teaching them to write and recognize letters in their names, sing the alphabet song while pointing to the alphabet letters, and play alphabet letter games. In a different study Justice and Ezell (2002) read aloud big books using prompts that focused on alphabet letters (e.g., "Where is the letter B on this page?" "Does anyone see any letters in their name?" "What two letters are the same on this page?"). In both studies children increased their ability to name alphabet letters.

Notice that the kind of instruction for learning alphabet letter names provided in these studies was not much like the paired associate techniques and focus on letter features that I laid out as optimal. Letters in these studies were not taught in groups. For example, in the Roberts studies (Roberts, 2003; Roberts & Neal, 2004), one letter a week was taught and no explicit mention of review across weeks was mentioned in the study--although surely this was done. In no study were letter features discussed, and confusable letters were not addressed. However, letters were written frequently during instruction, and children sang the alphabet song. Clearly, much research is to be done in order to discover the most effective ways to teach children alphabet letter names, especially for children who find this difficult.

However, I am confident from the studies that I have reviewed, and others I will now turn to, that we can expect preschoolers to learn from 50-75% of the alphabet letter names before the end of preschool. The benefit of knowing this many letters is that learning the remainder of the letters should be quicker and easier (suggesting another study that ought to be conducted). Further, as shown by Treiman and her colleagues (Treiman et al., 1998), this level of alphabet knowledge will allow children to acquire awareness of sound-letter relationships more strategically, and as I will argue next, facilitate acquiring phonological awareness.

Acquiring Phonemic Awareness: The Legacy of Brian Byrne and His Colleagues

In 1989, Brian Byrne and his colleague Ruth Fielding-Barnsley began a series of studies aimed at answering the question: What is the minimum amount of information, including phonemic awareness, that young children need in order to acquire a rudimentary understanding of the alphabetic principle? (Byrne & Fielding-Barnsley, 1989, 1990, 1991, 1993, 1995; Byrne, 1996, 1998; Byrne, Fielding-Barnsley, & Ashley, 2000) Byrne (1998) defined the alphabetic principle as awareness that the letters which comprise printed words stand for individual sounds which comprise spoken language (p. 1). In a series of small-scale experiments, he and his colleague(s) taught children a series of skills using paired associate learning. For example, the children learned to segment the words *sat* and *mat*, and then they learned to read *sat* and *mat*. Next, the children were tested to determine if they had acquired the alphabetic principle on a transfer task. In this task, children were shown a printed word (such as *sow*), and asked whether the word was *sow* or *mow*. Finally, children learned letter-sound associations (i.e., m says /m/ and s says /s/). Again children were given the transfer test. Finally, children were taught the names of the two critical letters. In some experiments children were taught phoneme identity instead of phoneme

segmentation. For phoneme identity, children practiced matching and sorting words with the same beginning phoneme.

In every experiment, children performed above chance on the transfer test only after: (a) learning to read the words *mat* and *sat*; (b) learning the letter-sound associations of *m* and *s*; and (c) acquiring phoneme identity. Thus, these researchers concluded that phoneme identity and knowledge of letter-sound relationships were the minimal concepts required to induce the alphabetic principle. Murray's (1998) research with kindergartners provides some additional support for this hypothesis. Byrne and Fielding-Barnsley's research clearly demonstrates that the easiest level of phonemic awareness that matters in helping children reach the critical insight to reading (i.e., the alphabetic principle) is phoneme identity, although this needs to be accompanied by knowledge of letter-sound relationships.

These results led Byrne and Fielding-Barnsley to develop a program for teaching phoneme identity, which they called *Sound Foundations* (1991). They evaluated its effectiveness on children's development of phonemic awareness, acquisition of the alphabetic principle, and on later reading and writing performance in a larger-scale training study. The treatment consisted of teaching children to recognize six phonemes in initial and final positions in words. Children in the treatment group were taught in small groups of 4-6 by Ruth Fielding-Barnsley for 20 minutes once a week for 12 weeks using pictures presented on large posters and worksheets. Children in the control group used the same materials as the treatment group; however, they were taught to sort pictures by semantic categories rather than by first or last phoneme.

Children in the treatment group scored higher on a posttest of phoneme identity both for the phonemes that were included in the lessons and for phonemes that were never taught. Only 32% of the children in the control group reached the criterion level; whereas, 95% of the treatment children reached criterion on this assessment. Only 15% of the children in the control group reached criterion on the alphabetic principle transfer task; whereas, 47% of the treatment children reached criterion on this same task--which was not included in the instruction.

A follow-up study of children in kindergarten (Byrne & Fielding-Barnsley, 1993) showed that treatment children were better than the control children on final phoneme identity but not initial, and that they were also better at pseudoword identification. In grades 1 and 2 (Byrne & Fielding-Barnsley, 1995) treatment children were still better at identifying pseudowords in first grade and better at comprehension as well in grade 2. Differences favoring the treatment group children were still found in a follow-up study when the children were in fifth grade (Byrne, Fielding-Barnsley, & Ashley, 2000) on word attack and identifying irregular words.

In 1995 Byrne and Fielding-Barnsley reported the results of an additional instructional study of classroom teachers who implemented the *Sound Foundation* program using whole group instruction. Teachers did not implement the program with as much fidelity as in the original study, and the results were less promising. Only 52% of the treatment children reached criterion on the phoneme identity test compared to the 95% who achieved it with more intensive, small-group instruction delivered by the researcher.

There are other differences between the original study and the classroom study that merit

close attention. The original study included middle-income children with a mean expressive vocabulary score of 110. These children knew a mean of 12.6 alphabet letters at the onset of the study. A sizeable proportion of the children had high levels of phoneme identity before the study began. In the 2000 report, these researchers revealed that they had assessed whether each child was secure in the concept of phoneme identity at the end of each of the preschool instructional lessons. In order to be secure, children had to identify correctly every picture in the poster and worksheet that began with the target sound. Twenty-six of the sixty-four treatment children were judged to be secure in the very first lesson and remained secure for the remainder of the instruction.

For the classroom study, information about children's initial levels of literacy knowledge is not described. However, it could be that children began instruction in the classroom study with lower levels of literacy knowledge. This hypothesis is supported by the results of a study by Whitehurst and his colleagues (Whitehurst, Epstein, Angell, Payne, Crone, & Fischel, 1994; Whitehurst, Zevenbergen, Crone, Schultz, Velting, & Fischel, 1999) in which they implemented *Sound Foundations* in Head Start classrooms in the United States.

Whitehurst and others (1994, 1999) attempted to intensify phoneme identity instruction by teaching children the *Sound Foundations* program three days a week over a longer period of time, although instruction was delivered in whole group settings. However, at the beginning of this study, children's alphabet knowledge and their ability to identify same-different sounds were below normal. The mean score of oral vocabulary ranged from 86 to 90 among the different treatment groups. Thus, it seems clear that the Head Start children began *Sound Foundations* with considerably lower expressive vocabulary levels, less alphabet knowledge, and lower than normal levels of phonological awareness compared to children in the Australian study (Byrne & Fielding-Barnsley, 1991).

Differences in both the starting levels of skills of the children and the intensity of the instruction could explain the difference in results between the Australian study and the Head Start study. Whitehurst and his colleagues (1994) did find differences between the treatment and control group in both preschool and kindergarten (although not second grade), but not the dramatic differences found in the Australian study. It could be that the children in the Head Start study were less responsible to the instruction within *Sound Foundations* because they did not have sufficient levels of literacy knowledge at the onset to take advantage of this instruction. Perhaps they lacked sufficient potential to learn what was taught.

Byrne and his colleagues argued that children's responsiveness to instruction is based on whether they have the potential to learn what is taught in instruction (Byrne, Fielding-Barnsley, & Ashley, 2000). Responsiveness to instruction, actually learning what is taught, is as Treiman and others (1998) have argued, is a function of the effectiveness of instruction and children's "ability to learn from and make sense of the instruction" (p. 1536). Children may need to have acquired a certain threshold of knowledge in order to learn from and make sense of certain kinds of instruction (Byrne, 1998).

There is research suggesting that alphabet letter knowledge may, indeed, act as a threshold enabling children to acquire phonological concepts (Stahl & Murray, 1994). For example,

Johnston, Anderson, and Holligan (1996) showed that there is a strong relationship between knowing some alphabet letters and being able to perform phonemic awareness tasks. These researchers identified children who could not name any letters versus those who could identify one or more letters. They also identified children who could not segment or delete even one phoneme versus those who could. They found 25 children who knew one or more letters and could also segment or delete one or more phonemes. These children knew a mean of eight letters. They also found a group of 17 children who knew one or more letters but could not segment or delete a single phoneme. They knew a mean of fewer than two letters. There was only one child who could segment or delete at least one phoneme who knew no alphabet letters. These results indicate that children's knowledge of alphabet letter names, even a few, is related to their being able to perform phonemic awareness tasks. Treiman's argument (Treiman & Kessler, 2003) that knowing some alphabet letter names facilitates children's awareness of letter-sound relations suggests a possible mechanism by which alphabet letters provide the potential to learn phonemic awareness. Knowing a threshold number of letters (more than two at least) may provide the potential to notice the phonological properties of a letter name including its phoneme, and thus to operate at the level of phoneme at least unconsciously. This in turn enables children to acquire the more conscious competency of letter-sound knowledge and phoneme identity. This may explain why phonological training studies that have also included instruction in letter-sounds have found superior effects compared to instruction without letter-sound instruction (*Report of the National Reading Panel*, 2000). Knowing a few letter names facilitates children's awareness of the phonological properties in a letter name and facilitates learning letter-sound associations. Learning letter-sounds and discovering, at the intuitive level, phonological properties of letter names provides the potential for and facilitates the acquisition of more explicit phonemic awareness. This may also explain why preschoolers in Read's (1975) study were able to discover how to spell words before being able to read. They may have used alphabet letter knowledge to identify sound segments in words.

The concept of "potential to learn," for example, the potential to learn alphabet letter names or letter-sounds or phoneme identity, is a concept that deserves more research. Of course, potential to learn is entirely dependent on what is to be taught. I am suggesting that knowing some alphabet letters, perhaps eight or more, provides the potential to acquire some phonological awareness. Using letters in phonemic awareness instruction, drawing explicit attention to the phoneme embedded in the letter name, and drawing explicit attention to vocal gestures when saying both the phoneme and letter name may enable children who already know some letter names to acquire initial phonemic insights. Thus, learning some alphabet letters may enable children to take advantage of more complex instruction, such as acquiring a concept of phoneme identity. Similarly, singing the alphabet song and learning to recognize, write, and spell their names may enable children to take advantage of the more complex letter-name instruction.

A recent review of longitudinal and training studies in phonemic awareness also supports this conclusion. Castles and Coltheart (2004) argued that no study has actually demonstrated that phonological awareness has been taught prior to any emergence of literacy knowledge including letter recognition. Further, they argued there was no evidence to suggest that syllable manipulation

or segmenting words into sentences were related to later development in phonemic awareness. This conclusion is supported by another review of research on rhyme instruction and its role in learning to read and spell (Macmillan, 2002).

Therefore, I conclude that the levels of alphabet knowledge and phonemic awareness that can be expected to emerge at the end of preschool are:

1. recognition of 50-75% of upper and lower case alphabet letters (Bloodgood, 1999; Treiman & Kessler, 2003; Worden & Boettcher, 1990; Roberts 2003; Roberts & Neal, 2004)
2. phoneme identity of 6 or more phonemes (Byrne & Fielding-Barnsley, 1991, 1993, 1995; Justice et al., 2003; Lundberg et al., 1988; Ukrainetz et al., 2000)
3. knowledge of 6-9 letter-sound relationships (Treiman & Kessler, 2003; suggested by Byrne & Fielding-Barnsley, 1991, 1993, 1995)
4. rudimentary use of the alphabetic principle in reading new words in familiar rhyming word families (Byrne & Fielding-Barnsley, 1991; Byrne, Fielding-Barnsley, & Ashley, 2000) and spelling words using early invented spellings (Read, 1975).

EFFECTIVE PHONEME IDENTITY INSTRUCTION

The second question that framed this paper was: What does research reveal about effective instruction in alphabet knowledge and phonemic awareness? In order to answer this question, I reexamined any research study in which preschool children were taught alphabet recognition, phoneme identity, letter-sound relationships, rudimentary word reading, or invented spelling. However, because of length constraints, I will only describe one set of research-based assumptions that I deduced related to instruction in phoneme identity:

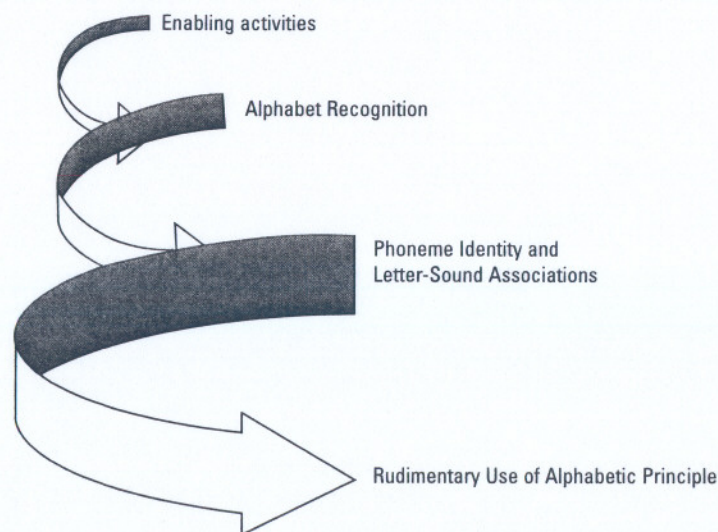
1. Begin instruction when children know some alphabet letters, perhaps 8 or more letters (Johnston, Anderson, & Holligan, 1996).
2. Begin instruction when children know the names of the alphabet letters associated with the phonemes to be taught (Treiman & Kessler, 2003).
3. Teach a small set of 5 to 6 phonemes including CV non-continuants and VC continuants (Byrne & Fielding-Barnsley, 1991; Treiman & Kessler, 2003).
4. Use continuants early in instruction (Byrne & Fielding-Barnsley, 1991).
5. Draw attention to the phoneme in the letter name (Treiman & Kessler, 2003).
6. Draw attention to vocal gesture in both the phoneme in isolation and in words (Murray, 1998).
7. Make explicit that certain words are alike because they have the same phoneme (Byrne & Fielding-Barnsley, 1991; Murray, 1998; Byrne, 1998).
8. Focus on the phoneme at the beginning and then the end of words (Byrne & Fielding-Barnsley, 1991).

9. When more than one phoneme is acquired, have children sort or match pictures by phoneme (Byrne & Fielding-Barnsley, 1991; Murray, 1998).
10. When a child does not acquire phoneme identity after several days of instruction, consider the child's potential to learn and provide enabling activities (Byrne, 1998).
11. Segue from phoneme identity instruction to letter-sound instruction in each lesson so both are coordinated in order that both letter-sound learning and phoneme identity are boosted at rates beyond rote learning (Treiman & Kessler, 2003; *The Report of the National Reading Panel*, 2000).

THE CASCADE OF INSIGHTS

Based on this list of critical preschool competences and on my lists of assumptions about effective instruction derived from research, I propose a model of preschool early literacy curriculum, which I call, based on Byrne's suggestion (1998, p. 140), *The Cascade of Insights*. Figure 1 presents this model curriculum, an unfolding of increasingly complex concepts which I argue should define the preschool curriculum in teaching alphabet knowledge and phonemic awareness (obviously not the entire early literacy curriculum). First, instruction should focus on activities that seem to enable both the acquisition of alphabet letter naming and phonemic awareness. Research suggests these Enabling Activities would include: singing the alphabet song (Treiman & Kessler, 2003), reading alphabet books (Murray, Stahl, & Ivy, 1996); listening to and reciting nursery rhymes and singing songs with rhyme (MacLean, Bryant, & Bradley, 1987); and

Figure 1 The Cascade of Insights



learning to recognize, write, and spell names (Bloodgood, 1999). Reading and attending to the letters in environmental print may also be enabling (Cronin, Farrell, & Delaney, 1999; McGee, Lomax, & Head, 1988); however, some researchers have found that environmental print does not lead children to more sophisticated understandings (Masonheimer, Drum, & Ehri, 1984). Tapping syllables, segmenting sentences into words, and learning rhyming words may also be in this category (Lundberg et al, 1988; Schneider et al., 1997). It is clear that some, although few, young children can and do develop these concepts even without instruction (MacLean, Bryant, & Bradley, 1987; Lonigan et al, 1998); however, no research has shown that children *must* learn these skills before moving to the level of phoneme or even whether doing so makes it easier to learn about phonemes (Castles & Coltheart, 2004; Macmillan, 2002). Brady and her colleagues (Brady, Fowler, Stone, & Winsbury, 1994) commented that having kindergartners segment sentences into words seemed to confuse children; Schneider and his colleagues (Schneider, Kuspert, Roth, & Vise, 1997) who replicated the Lundberg et al (1988) study with German kindergartners, found that shortening the length of time spent in rhyming instruction and lengthening the amount of time spent on analyzing phonemes had more effect on later reading and writing development. Van Kleeck and her colleagues (Van Kleeck, Gillam, & McFadden, 1998) discovered that preschoolers who spent an entire semester learning rhyme yielded no better rhyming skills than children who merely participated in their regular instruction, although the same amount of time spent on phoneme instruction was powerful in increasing phonemic awareness. Further, Byrne and Fielding-Barnsley's extensive line of research demonstrated that children can go directly to the level of phoneme without practice with larger linguistic units.

Enabling activities should accelerate children's learning of alphabet letter names. Once children acquire some alphabet name knowledge, and research suggests that it might be the acquisition of eight or more alphabet letter names (Johnston, Anderson, & Holligan, 1996), phoneme identity instruction may begin. However, Byrne and Fielding-Barnsley's (1991) research implied that this instruction can wait until some children have higher levels of alphabet knowledge and some children have already developed some level of phonemic awareness from more informal activities before initiating instruction for all children. Letter-sound instruction should occur simultaneously, and be coordinated with, phoneme identity instruction. Instruction should capitalize on children's knowledge of letter names and demonstrate how to use vocal gestures to discover letter-sound relationships. Letter sound and phoneme identity instruction should focus on a small group of letters and phonemes so that children are quickly led to the alphabetic principle. When letter-sounds and phoneme identity are achieved, children should be introduced to rudimentary alphabetic principle activities. Children can identify whether a word like *mat* says *sat* or *mat* and be guided in how to turn the word *mat* into *fat*. This is precisely Byrne and Fielding-Barnsley's transfer of the alphabetic principle task with the instructional components of scaffolding and problem solving (which they never included). In addition, children could be guided to invent spellings as another appropriate rudimentary use of the alphabetic principle.

TO WHAT EXTENT DOES A RESEARCH-BASED CURRICULUM REFLECT THE RESEARCH?

Because of length constraints I review only one curriculum, *SRA Open Court Reading* (Bereiter, Campione, Carruthers, Hirshberg, McKeough, Pressley, Roit, Scardamalia, Stein, & Treadway, 2003), because of its strong claim to being research-based (p. vi-vii). I will only address the contents of two portions of this curriculum—Phonological and Phonemic Awareness and Alphabetic Principle.

This curriculum is divided into 160 lessons divided into 8 units of 20 lessons each. Every lesson in the Phonological and Phonemic Awareness section of the curriculum, which I will refer to as PA lessons, includes two parts: a finger play or song (many of which include rhyming words), and a sound activity. During Lessons 1-51, PA sound activities introduce children to differentiating among sounds that are loud and soft, animal sounds, and environmental sounds. Children identify first and last picture, first and last environmental or animal sound, and segment sentences into words. Thus, for 51 lessons, children focus on sounds in their environment, sounds that animals make, loud and soft sounds, and segmenting words into sentences. We currently have no research suggesting that these activities are helpful in acquiring phonological awareness and at least two reviews that suggest they are not (Castles & Coltheart, 2004; Macmillan, 2002).

On the 52nd lesson in this curriculum, children are introduced explicitly to the concept of rhyme. Prior to this lesson, in 21 lessons, teachers are told: "Have children identify rhyming words" found in the finger plays or songs. Thus, in 21 lessons, children are asked to perform a phonological task that they have not been taught in this systematic curriculum.

Beginning in Lesson 61, a new component is added to instruction: lessons in Alphabetic Principle. The lessons in Alphabetic Principle follow directly the lessons in PA. In PA Lessons 61-86 children are taught to identify rhyming words and to orally blend compound words like cupcakes or two-syllable words like pencil. In Alphabetic Principle Lessons 61-86, children are taught letter-sound associations for letters. Notice that the level of linguistic unit called for in PA lessons is the syllable, while the linguistic unit called for in Alphabetic Principle lessons is the phoneme. It is not until Lesson 87 that children begin to blend single onsets and rimes and, therefore, operate at the level of phoneme during both PA and Alphabetic Principle lessons. Thus, for 26 lessons, the level of phonological functioning expected in PA is different from that expected in Alphabetic Principle lessons. Children are taught eight letter-sound associations (phonemes) before ever being taught to perceive phonemes in PA instruction. It could be that this is intentional. Children may use rote memory to learn letter-sound relationships and doing so may increase their awareness and ability to perceive phonemes. However, research suggests that children can be more strategic in learning letter-sound relationships than merely relying on rote memorizing (Treiman & Kessler, 2003).

In Units seven and eight, children are taught to blend and segment two- and three-phoneme words. These are activities which *The Report of the National Reading Panel* (2000) suggests are more appropriate for kindergarten or first grade.

This curriculum never directly teaches phoneme identity. The activities included in the

Alphabet Principle portion of each lesson came closest to allowing children to develop this concept. Children practice judging whether a phoneme is located in spoken words by holding up a letter card when they hear their teacher say a word with the target phoneme. However, in the entire curriculum, the teacher never is directed to make explicit that these words are all spelled with the same letter because they have the same phoneme. Nonetheless, it is certainly the case that children might infer this concept from the variety of instruction that is provided. Further, teachers are also never directed to make connections between what they are teaching or have already taught during either PA or Alphabetic Principle lessons or vice versa despite the fact that these two lessons are always taught one after the other. Children are never directed to listen for phonemes in letter names and vocal gestures are not described.

It is important to note that this curriculum is based on the research of Lundberg and others (1988) and replicated by Schneider and others (1997). Nevertheless, I have revealed that there are portions of this research-based curriculum that are not supported by research. Children are asked to perform tasks with linguistic units before they are explicitly taught to perceive those units. A large portion of the PA lessons focuses on linguistic units, such as environmental sounds and syllables, for which we have no research to indicate its usefulness (Macmillan, 2002). It could be that the Lundberg and others' (1988) and Schneider and others' (1997) success with this kind of curriculum is due to the very small amount of time the curriculum devotes to phoneme level processing. There is also a lack of coordination between PA instruction and Alphabetic Principle instruction so that the boost that children could acquire through coordinating these activities is lost (Treiman & Kessler, 2003). Finally, the curriculum teaches children segmenting and blending two- and three-phoneme words, skills which *The Report of the National Reading Panel* (2000) suggests are more appropriate in kindergarten and beyond.

Thus, I would argue that we would not be wise to use this evidence-based curriculum, and probably any evidence-based curriculum, with strict fidelity. Fidelity, for research purposes and for Reading First purposes, means that teachers are expected to use the curriculum materials without substitution or modification and to implement the instructional practices only as specified in the curriculum. Yet, as I have shown, this curriculum, while clearly having direct ties to research in some places, has components without result support.

Before I draw my final conclusions, I want to describe a child for whom preschool really mattered. Quinlan entered a preschool in Alabama that primarily serves children from low-income families with a standard score of 65 on an expressive vocabulary test. He knew no alphabet letters, could only identify the front and back of a book, did not know rhyming words, and could not write his name. He ended preschool with a standard vocabulary score of 76, could write his name in conventional form, knew 26 upper case and 25 lower case letters, could rhyme, could identify and isolate phonemes in words, and could invent spellings with one or two letters. His kindergarten teacher called him "her best student." He is lucky to have attended a preschool in which his teacher was skillful in helping children learn what they must while also encouraging their playful and unconventional explorations of print. All children, like Quinlan, deserve a long line of successes rather than a string of failures. We cannot wait until the end of an intensive intervention

program to discover that 35-45% of the children in the program are treatment resisters (Torgesen, 2000). Instead we must frequently consider children's potential to learn and modify our instruction to allow children to develop this potential rather than teaching the curriculum.

In conclusion, I ask, what is the role of wisdom in the face of public policies recommending, even requiring, use of a curriculum based on scientifically-based research? While wisdom has been defined in different ways by different researchers, in general, it is considered to be the use of extensive knowledge and experience to make ethical decisions that promote the good for everyone rather than for just a few (e.g., Baltès & Staudinger, 2000; Sternberg, 2003). In our case, as NRC members, this means we must have extensive knowledge of research and extensive experience with children and teachers in classrooms where learning occurs. If we are not wise about the use of research in instruction, who will be? If we are not wise about identifying which components of a curriculum are based on research and which components are not, who will? If we are not wise enough to communicate to the public that no curriculum can ever be entirely based on research—we simply don't have all the research we need, then who will do so? As members of NRC, we must be wise.

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