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First-Year Teacher Knowledge of Phonemic Awareness and Its Instruction

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Converging evidence has identified phonemic awareness (PA) as one of five essential components of beginning reading instruction. Evidence suggests that many teachers do not have the recommended knowledge or skills sufficient to provide effective PA instruction within the context of scientifically validated reading education. This study examines the knowledge of PA instruction of 223 first-year teachers initially certified in special education, early childhood education, and elementary education. Results indicate that significant numbers of beginning special and general education teachers in this sample appear to be inadequately prepared with respect to PA instruction. They have limited knowledge of PA, confuse PA with phonics, are generally unable to select task-appropriate materials or activities, and lack skill in analyzing written words into phonemes. Special educators did not have significantly more knowledge or skills than their general education counterparts. These findings suggest that university teacher education programs may not be providing future teachers with sufficient content or practice with respect to PA instruction.

Keywords: *knowledge base for teaching; knowledge level; higher education; phonemic awareness; phonics; teacher education*

“Research now shows that a child who doesn’t learn the reading basics early is unlikely to learn them at all . . . and will not easily master other skills and knowledge, and is unlikely to ever flourish in school or in life” (Moats, 1999, p. 5). Although scientists now estimate that over 90% of children can be taught to read using research-based instruction (Torgesen, 2000), estimates of the percentages of reading failure hover at 38% for fourth-grade students, a figure not significantly different than in 1992 (U.S. Department of Education, 2005). Effective reading

instruction has become a national priority (Shankweiler & Fowler, 2004).

The ultimate goal of reading instruction is, of course, to help children acquire the skills necessary to comprehend printed material at a level consistent with their general language comprehension abilities (Torgesen, 2000). The landmark *Report of the National Reading Panel* (2000) identified five essential areas for comprehensive reading instruction. Three areas of instruction help children identify words accurately and fluently—phonemic awareness (PA), systematic phonics, and reading

fluency—and two help children construct meaning once words are identified—vocabulary and comprehension strategies (Torgesen, 2006).

Children who have PA skills are likely to have an easier time learning to read and decode unfamiliar words than those who lack these skills, and those with fluent and accurate decoding skills will likely be better readers (Shankweiler & Fowler, 2004). The importance of accurate and fluent decoding in reading comprehension was demonstrated in a study by Shankweiler et al. (1999), who found a high correlation between decoding and reading comprehension in children ages 7 to 9. Accurate decoding, in turn, requires an understanding of the alphabetic principle, the idea that the sequence of speech sounds, or phonemes, corresponds to letters in written words (National Reading Panel, 2000). An essential prerequisite for making sense of and using the alphabetic principle for decoding words is an awareness of the sequence of speech sounds in spoken words, or PA (Liberman, Shankweiler, & Liberman, 1989). Neurological research using functional magnetic resonance imaging confirms that deficits in PA are characteristic markers of reading disability (Shaywitz et al., 2002). Adams (in Adams et al., 1991) described the discovery and documentation of the importance of PA in beginning reading instruction as “the single most powerful advance in the science and pedagogy of reading” (p. 392) of the 20th century.

Although PA is a term that is widely used in reading circles, it is often confused with phonics—using letter-sound relationships to read and spell words—and phonological awareness. PA is actually one type of phonological awareness. Broader phonological awareness includes identifying and producing oral rhymes and working with syllables. PA lies within a narrower form of phonological awareness that focuses on identifying and

working with individual speech sounds, or phonemes, the smallest unit of speech that can change the meaning of a word (Armbruster, Lehr, & Osborn, 2001). For example, deleting the /p/ sound from the word *spoon* changes it to *soon*, thus changing the meaning of the word.

Several kinds of activities help children develop an awareness of phonemes in spoken words. Matching phonemes helps children recognize the same sounds in different words (i.e., “Which two words have the same ending sound? *Hose, house, buzz?* *Hose* and *buzz*.”). In phoneme blending activities, children listen to a sequence of separately spoken phonemes and then blend them together to form a word (i.e., “What word do these sounds make—/k/ /a/ /t/? *Cat*.”) In phoneme segmentation activities, children break a spoken word into separate phonemes (i.e., “Tap out the sounds in *drum*. /d/ /r/ /u/ /m/.”) Segmentation may also involve counting phonemes in words (i.e., “How many sounds are in the word *drum*? Four sounds”). Phoneme deletion requires children to recognize the word that remains after a phoneme is removed (i.e., “Say *faster*. Now say *faster* without the /s/ sound. *Fatter*.”) The National Reading Panel (2000) found that children who receive instruction that focuses on one or two types of PA activities make greater gains in reading and spelling than do children who are taught three or more types. Blending relates directly to decoding; segmenting relates directly to spelling.

After examining more than 50 studies documenting the importance of PA, the National Reading Panel (2000) concluded that teaching children to manipulate phonemes helps them learn to read and that the effects of PA training on reading endured well beyond the end of PA training. For example, when kindergarten and first-grade students, including those at-risk for reading failure due to initially low levels of PA, are trained to attend to

meaningless sounds in words and then to associate those sounds with letters, skills in phoneme segmentation and word identification are significantly higher than for those students who did not receive such training (Blachman, 1991; Blachman, Tangel, Ball, Black, & McGraw, 1999). Although PA has been shown to be an essential precursor to understanding the alphabetic principle, it is not sufficient without explicit instruction in how letters connect to phonemes, or phonics (Adams, 1990; Blachman, 1997; National Reading Panel, 2000; Snow, Burns, & Griffin, 1998; Troia, 1999).

Although most children respond well to classroom instruction in PA, some children respond poorly or not at all (Torgesen, 2000). It can be argued, then, that special educators need a deeper level of understanding than do their regular education counterparts to provide effective instruction to these students. Some evidence suggests students with serious reading accuracy and fluency problems respond to instruction that is explicit, comprehensive, intensive, and supportive (Foorman & Torgesen, 2001). In one landmark study, Torgesen et al. (2001) conducted intensive intervention to children with severe reading disabilities. Providing instruction for 2 hours per day for 8 weeks in PA, phoneme articulation, and basic decoding skills resulted in significant and stable gains in reading and comprehension skills. The children achieved average word-reading accuracy, and their reading rate more than doubled from pretest to the end of the follow-up period. Within 1 year following the intervention, 40% of the students were no longer in need of special education services. Likewise, older students with poor reading skills showed significant gains in decoding, fluency, and spelling after explicit instruction in PA and the alphabetic code (Blachman et al., 2004). This instruction has been shown to actually change the way the brain functions as children read

(Shaywitz et al., 2004). For children who struggle with reading acquisition, effective PA instruction requires a teacher who thoroughly understands its implications for reading achievement, has competent skills, and has a complete understanding of the content, scope, and sequence of instruction to provide instruction that is more explicit, comprehensive, intensive, and supportive than is necessary for normally progressing students.

Student reading achievement has been linked to teacher knowledge about language structure. Darling-Hammond (2000) reported that teacher preparation is a stronger correlate of student achievement than class size, overall spending, or teacher salaries. This preparation accounts for as much as 60% of the total achievement variance after taking students' demographics into account. In an early, small-scale study, Brady, Fowler, Stone, and Winbury (1994) explored the benefits of preparing kindergarten teachers with 8 hours of initial training and weekly classroom support in delivering phonological awareness instruction in the regular classroom. Two control teachers followed the standard curriculum of the day, which did not include PA activities. One year after training, the 42 experimental students, located in 12 different elementary schools, significantly outperformed students in the control group on measures of PA and beginning reading. In a similar study, McCutchen et al. (2002) measured kindergarten and first-grade teachers' ($n = 44$) knowledge base in concepts related to phonology and early reading instruction. Approximately half of the teachers in this sample ($n = 24$) then attended a 2-week summer institute designed to increase understanding of phonology and basic reading concepts. Posttraining results showed that the knowledge of experimental teachers significantly improved after the summer institute. During the following year, teachers self-selected instructional materials for their

kindergarten and first-grade students. After 1 year, students in the experimental teachers' classrooms obtained significantly better results in phonological awareness and basic reading skills than did students taught by less knowledgeable teachers.

Spear-Swerling and Brucker (2004) studied the relationship between teacher preparation within a special education teacher certification program and reading gains made by second-grade children with mild word-decoding problems. This study showed that even novice teachers with limited training and experience can have a positive impact on children's skills in basic decoding and spelling abilities. After only 6 hours of university classroom instruction in word structure, the teachers planned and implemented six 1-hour lessons in a supervised setting. Posttest results showed that tutored children improved significantly from pretest to posttest in knowledge of letter sounds, decoding, and spelling of phonetically regular words and reading phonetically irregular words. In addition, there were significant posttest correlations between novice teachers' understanding of English word structure and children's posttest scores in decoding and spelling. These studies demonstrated that pre-service and experienced teachers can improve their knowledge of phonology and basic orthography with relatively little training, and the gain in teacher knowledge has positive effects on student achievement.

In recent years, several professional organizations and alliances have published recommendations or position papers concerning competencies required of teachers with respect to reading and spelling instruction (American Federation of Teachers, 1999; International Dyslexia Association, 1997; International Reading Association, 1998; International Reading Association and the National Association for the Education of Young Children, 1998; Learning Disabilities Association of

America, 1997; Learning First Alliance, 2000). The majority of these positions recommend that teachers need a solid foundation in the theory and scientific underpinnings of reading instruction, which includes PA, so that they can correctly interpret student error patterns and base instruction on evidence, not ideology. For example, children who consistently omit phonemes in words (i.e., they spell *fog* for *frog*) need instruction in phoneme awareness; those who spell phonetically but without regard for spelling conventions (i.e., *bak* for *bake*) need instruction in phonics.

Although the reading literature now provides clear direction for teacher education in reading instruction (McCardle & Chhabra, 2004; National Reading Panel, 2000), many scholars have asserted that teacher education programs do not include sufficient depth of training necessary to prepare future teachers to provide effective beginning reading instruction (American Council on Education, 1999; American Federation of Teachers, 1999; Hill, 2000; International Dyslexia Association, 1997; Liberman, 1987; Lyon, 1999; Moats & Farrell, 1999; Walsh, Glaser, & Wilcos, 2006). In a recent study of 223 required reading courses from 72 randomly selected education schools, the National Council on Teacher Quality found that only 15% of the education schools provide elementary teacher candidates with minimal exposure to the five scientifically validated core components of reading instruction—PA, systematic phonics, fluency, vocabulary, and comprehension strategies (Walsh et al., 2006). Although “real expertise” may not be possible to acquire in a preservice program, Walsh et al. (2006) contend that

it is the obligation of the schools of education to provide foundational knowledge of this research. New teachers should enter the classroom understanding the five components

of scientifically based reading instruction and know when and how to deploy each one of them. Teachers who have that knowledge are simply more effective teachers. (p. 47)

Other studies suggest that many licensed teachers do not have the recommended background knowledge or skills in PA or English orthography to provide reading instruction that is based on empirically validated instructional content and methodology (Bos, Mather, Dickson, Podhajski, & Chard, 2001; Moats & Foorman, 2003; Scarborough, Ehri, Olson, & Fowler, 1998). In an early exploratory study of teacher knowledge, Moats (1994) reported that a majority of teachers who voluntarily enrolled in a language study class demonstrated very limited knowledge of the structure of spoken and written English. Subsequent studies of teacher competency in this area have shown similar incomplete knowledge among teachers in other parts of the United States. Scarborough et al. (1998) found that adolescents and adults with no apparent reading problems had problem segmenting consonant clusters within words. As part of this study, investigators examined the phoneme-counting and letter-sound mapping abilities of college students enrolled in teacher education programs. Participants were asked to draw a line under each letter or letter cluster that represented a single phoneme and to record the number of sounds in each word. Results indicated that the mean number of words correctly segmented by these teachers was fewer than half, suggesting that people with competent reading skills may not have a precise understanding of how speech sounds map to the orthography.

In substantive studies of both experienced teachers and teachers-in-training, other studies reported similar results. Among teachers in the American southwest studied by Bos et al. (2001), more than half of the 252 pre-service and 286 in-service educators in this

sample were unable to answer nearly half of the questions regarding knowledge of language structure. In the context of a longitudinal study of reading instruction in low-performing, high-poverty urban schools, Moats and Foorman (2003) provided evidence that about 20% of 194 licensed elementary teachers in Texas and the District of Columbia had a very limited understanding of language concepts critical for explicit reading instruction. Approximately 45% more had partial conceptual knowledge of language, reading development, or informal assessment. These studies support and extend the Scarborough et al. (1998) study, showing that many teachers are unable to accurately count phonemes in words greater than two sounds or show how speech sounds are represented by print.

Cunningham, Perry, Stanovich, and Stanovich (2004) surveyed the perceived and actual reading-related knowledge in a large ($N = 722$) sample of teachers. They found that teachers tended to overestimate their actual level of knowledge in PA and phonics. Almost 20% of the kindergarten to third-grade teachers in this sample could not segment any of the 11 words into speech sounds; 30% could correctly identify the number of phonemes in only half the items. Approximately 40% could not identify common irregular words in a list of 26 words. In a debriefing following the survey, teachers reported that they had not received instruction concerning the complex structure of written English in their teacher preparation programs, nor did their teaching materials emphasize this information. This study raised questions regarding these teachers' preparation to teach PA, to help students use the alphabetic principle to decode and spell words, to select appropriate instructional texts, or to respond appropriately to student errors in reading and spelling.

The teachers' own basic skills may affect their ability to absorb the complexities of

English language structure presented in teacher education programs. Spear-Swerling and Brucker (2003) provided evidence that many teacher candidates enrolled in a special education licensure program have incomplete knowledge about word structure and the ability to understand how phonemes map to graphemes in written language. In a follow-up study, these investigators examined the relationship between teacher-education students' component reading-related abilities and their ability to acquire word-structure knowledge (Spear-Swerling & Brucker, 2006). Results showed that some students' basic decoding and spelling skills were below average, despite average reading comprehension and passing scores on the PRAXIS I (Educational Testing Service, 1994) teacher competency test. Students' decoding and spelling skills, but not their comprehension or reading speed, influenced their ability to acquire word-structure knowledge. Prior to instruction, though, even students with strong decoding and spelling skills scored well below the maximum possible on phoneme-counting tasks. Thus, even strong word reading and spelling abilities did not automatically impart the ability to identify the number of phonemes in a set of one- and two-syllable written real words and to show which letter(s) represented each phoneme in the word. This evidence suggests that proficient reading and writing skills do not automatically translate into the ability to teach basic literacy skills to beginning readers without specific training in English word structure.

As a step toward evaluating the outcome results of special and general education course work in reading instruction, the present study examined the competencies with respect to PA of recent graduates of teacher education programs—first-year teachers initially certified in comprehensive special education, elementary education, and early childhood education (preschool through Grade 3). The

following research questions were explored in this study:

1. What is the level of knowledge about PA and PA skills of first-year teachers?
2. Can first-year teachers distinguish between PA and phonics?
3. Will there be differences in knowledge about PA, PA skills, and the ability to distinguish between PA and phonics among first-year teachers initially certified in comprehensive special education, elementary education, or early childhood education?

Method

Participants

Two hundred and twenty-three randomly selected first-year teachers from 102 school districts in a northeastern state participated in this study. Individuals in this sample represented graduates of teacher education programs in 15 different states. Although most of the teachers were educated in the eastern United States, this sample also included teachers who received their teacher education in southern, midwestern, and western states. Forty-six percent of the sample had a master's degree. The teachers in this sample were initially certified in special education ($n = 52$; 4 male, 48 female; mean age = 30.94 years, $SD = 9.20$), elementary education ($n = 118$; 6 male, 112 female; mean age = 28.14 years, $SD = 6.87$), and early childhood (pre-kindergarten through third grade) education ($n = 53$; 1 male, 52 female; mean age = 28.02 years, $SD = 6.26$). Most of the teachers were Caucasian (95%).

Materials and Procedures

Participants in this study were contacted through postal mail and asked to anonymously complete and return a 15-item multiple-choice

instrument, the *Survey of Teacher PhAKS (Phonemic Awareness, Knowledge, and Skills)*, which was developed by the first author and adapted from several sources (American Federation of Teachers, 1999; Bos et al., 2001; Mather, Bos, & Babur, 2001; Moats, 1994). The survey was mailed to 475 teachers; 46.9% (223 people) returned completed forms. For each item, there were three possible choices. A fourth item, *(d) I'm not sure*, was included for each item to discourage random guessing.

The survey included nine items to assess teacher knowledge about PA instruction. These items are shown in Table 2, with correct answers in bold type. The first six items pertaining to knowledge contained a phonic foil choice, an answer that better describes phonics (i.e., using the relationships between letters and speech sounds to read and spell) than PA (i.e., the ability to identify and work with the sounds of spoken language). Phonic foil items are italicized. The last six items in the survey assessed several key skills in phonological awareness, including the ability to identify, match, count, and delete phonemes in written words. These items are shown in Table 3, with correct answers in bold type.

Validity evidence based on content. For the *Survey of Teacher PhAKS*, judgmental evidence regarding item content was gathered prior to the development of the instrument. An initial pool of 25 items was rated by 17 expert judges selected by the investigator based on experience with PA instruction and professional accomplishments. These expert judges were experienced in one or more of the following: providing PA instruction to children, providing professional development to teachers about PA education, setting teacher standards at the state department of education level, or developing assessment instruments that include PA. These judges represent a cross-section of professions (e.g., university professors, special

education teachers, academic language therapists, speech and language therapists, and state department of education consultants).

A 16-item pilot study was conducted with a convenience sample of 127 graduate education students (mean age = 28; 95% Caucasian) enrolled in university teacher preparation programs. Participation was voluntary, and responses were strictly anonymous. This sample included a mix of pre-service ($n = 58$) and in-service ($n = 69$) teachers, with an average teaching experience of less than 4 years. Of the 69 in-service teachers, almost half (49%) had certification endorsement in Elementary Education, 25% had Special Education certification, with another 12% having cross-endorsement in Elementary and Special Education. Only 7% had Early Childhood certification endorsement, with another 7% having certification endorsement in other areas. The final instrument was revised based on the results of the pilot study.

Reliability. An analysis of the internal consistency reliability yielded a Kuder-Richardson 20 ($K-R_{20}$)¹ coefficient of .69. Because the *Survey of Teacher PhAKS* was intentionally brief to encourage respondents to return the survey, the Spearman-Brown Formula was used to estimate the reliability of scores from a similar test twice as long with homogeneous content (Isaac & Michael, 1995). Using this formula, doubling the number of test questions should increase the reliability to .82.

Results

A series of analyses were conducted to examine (a) the level of knowledge about PA and PA skills, (b) the ability to distinguish between PA and phonics, and (c) differences in knowledge and skill among special

Table 1
First-Year Teacher Performance in Items Related to Knowledge, PA Skills,
and the Total Instrument by Certification Endorsement Group

| Certification Endorsement | Knowledge (<i>n</i> = 9) | | PA Skills (<i>n</i> = 6) | | Total (<i>N</i> = 15) | |
|------------------------------------|---------------------------|-----------|---------------------------|-----------|------------------------|-----------|
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Special Education (<i>N</i> = 52) | .54 | (.24) | .64 | (.24) | .58 | (.20) |
| Early Childhood (<i>N</i> = 53) | .56 | (.27) | .64 | (.21) | .59 | (.21) |
| Elementary (<i>N</i> = 118) | .52 | (.23) | .62 | (.23) | .56 | (.19) |
| Total (<i>N</i> = 223) | .53 | (.24) | .63 | (.23) | .57 | (.19) |

Note: PA = phonemic awareness. Means are proportions correct of the maximum possible score for each area, averaged across all scores for the items related to knowledge, PA skills, and the total instrument.

educators and general education teachers certified in elementary and early childhood education.

Level of Knowledge and PA Skills

The first research question in this study focused on the level of knowledge with respect to PA instruction. Table 1 shows the scores of the three endorsement groups for items related to knowledge about PA, PA skills, and the total instrument, with scores expressed as proportion correct of the maximum possible score for each item. In all endorsement groups, first-year teachers performed slightly better in items related to PA skills than in items related to knowledge about PA instruction. However, scores in both categories were uniformly low. The distribution of raw scores on the 15-item instrument was positively skewed, ranging from 1 to 15 correct, with a mean of 8.6, a median of 8, and a mode of 6. Only 3 of the 223 subjects (1%) received a perfect score.

The first nine items on the instrument related to knowledge about PA instruction. Table 2 shows the mean scores for each item choice in items related to PA knowledge by certification endorsement group, with scores expressed as proportion correct of the maximum possible score for each item. Correct responses are shown in bold type. Items 1 to

4 measured one's understanding of key definitions and content related to PA instruction; Items 5 to 7 measured one's ability to identify activities that develop PA; Item 8 analyzed one's understanding of task difficulty; and Item 9 concerned the type of student PA instruction potentially benefits.

Although a majority of the novice teachers ($M = .94$) thought PA instruction potentially benefits most children in kindergarten and first grade (Item 9), little more than half ($M = .56$) understood the purpose of PA instruction (Item 3). Fewer still ($M = .41$) were able to identify the definition of PA (Item 2); most equated PA with understanding the relationships between letters and the sounds they represent. Nonetheless, three quarters of the teachers ($M = .74$) knew that a phoneme was a speech sound, not a letter (Item 1).

Recognizing activities that foster an awareness of phonemes was equally problematic. Although three quarters ($M = .74$) of the special educators could recognize which activity explicitly linked spelling with PA (Item 7), they could not consistently recognize other activities that develop PA (Items 4, 5, and 6). The vast majority of these first-year teachers did not appreciate that identifying the initial consonant sound within the consonant blend *s* required more refined PA than isolating the single sound /sh/, represented by the digraph *sh* (Item 8).

Table 2
First-Year Teacher Performance in Items Related to
Knowledge About PA Instruction

| Item | Certification | | | |
|--|---------------|------------|------------|------------|
| | T | SE | EC | EL |
| 1. A phoneme is | | | | |
| (a) <i>the smallest part of written language</i> | .14 | .11 | .11 | .15 |
| (b) the smallest part of spoken language | .74 | .83 | .74 | .71 |
| (c) a word part that contains a vowel sound | .08 | .06 | .09 | .09 |
| (d) I'm not sure | .04 | .00 | .06 | .05 |
| 2. Phonemic awareness is: | | | | |
| (a) <i>the same thing as phonics</i> | .00 | .00 | .00 | .00 |
| (b) <i>understanding the relationships between letters and the sounds they represent</i> | .59 | .60 | .45 | .65 |
| (c) the ability to identify and work with the individual sounds in spoken words | .41 | .40 | .55 | .35 |
| (d) I'm not sure | .00 | .00 | .00 | .00 |
| 3. Effective phonemic awareness instruction teaches children to: | | | | |
| (a) <i>convert letters or letter combinations into sounds</i> | .38 | .41 | .25 | .42 |
| (b) notice, think about, and work with sounds in spoken language | .56 | .57 | .61 | .53 |
| (c) discriminate one letter from the other letters of the alphabet | .04 | .02 | .10 | .02 |
| (d) I'm not sure | .02 | .00 | .04 | .03 |
| 4. The student's first lessons in phonemic awareness involve: | | | | |
| (a) <i>learning letter-sound relationships</i> | .60 | .61 | .55 | .61 |
| (b) matching spoken words with printed words | .02 | .04 | .00 | .02 |
| (c) identifying sounds shared among words | .33 | .33 | .41 | .30 |
| (d) I'm not sure | .05 | .02 | .04 | .07 |
| 5. A student has broad phonological awareness and now needs explicit phonemic awareness instruction. What type of activity focuses on phonemic awareness skills? | | | | |
| (a) <i>Color the pictures that begin with the letter <u>b</u></i> | .28 | .19 | .31 | .30 |
| (b) Count the syllables in the word <i>hotdog</i> | .11 | .14 | .15 | .07 |
| (c) Count the sounds in the word <i>cake</i> | .57 | .64 | .52 | .57 |
| (d) I'm not sure | .05 | .04 | .02 | .06 |
| 6. An example of explicit phonemic awareness instruction is: | | | | |
| (a) <i>teaching letter-sound correspondences</i> | .24 | .31 | .34 | .22 |
| (b) choosing the word in a set of four words that has the "odd" sound | .32 | .31 | .35 | .31 |
| (c) reading words in the same word family, e.g., <i>at, sat, mat, cat</i> | .34 | .26 | .38 | .35 |
| (d) I'm not sure | .10 | .12 | .04 | .12 |
| 7. Which activity explicitly links spelling with phonemic awareness? | | | | |
| (a) Make as many words as you can using only the letters <i>p, a, s, l</i> | .05 | .06 | .07 | .03 |
| (b) Say a word, then name the letters out loud; write the word | .17 | .16 | .17 | .18 |
| (c) Say a word, then tap out the sounds in the word; write the letters for these sounds | .72 | .74 | .70 | .72 |
| (d) I'm not sure | .06 | .04 | .06 | .07 |
| 8. Which task requires more refined phonemic awareness? | | | | |
| (a) What is the first sound in <i>sled</i>? | .23 | .17 | .26 | .24 |
| (b) What is the first sound in <i>shed</i> ? | .45 | .54 | .45 | .41 |
| (c) The tasks are the same. | .22 | .23 | .17 | .25 |
| (d) I'm not sure. | .10 | .06 | .11 | .10 |

(continued)

Table 2 (continued)

| Item | T | Certification | | |
|--|------------|---------------|------------|------------|
| | | SE | EC | EL |
| 9. Phonemic awareness instruction: | | | | |
| (a) is only meant for students at-risk for reading failure | .01 | .00 | .04 | .09 |
| (b) potentially benefits most children in kindergarten and 1st grade | .94 | .94 | .92 | .94 |
| (c) is not appropriate for older students (7+ years old) who have reading problems | .01 | .04 | .00 | .09 |
| (d) I'm not sure | .04 | .02 | .04 | .04 |
| Total mean score | .53 | .58 | .60 | .56 |

Note: Means are proportions correct of the maximum possible score for each item. Correct answers are in bold type. Phonic foil choices are italicized. PA = phonemic awareness; T = total sample average score; SE = special education; EC = early childhood; EL = elementary.

Six items related to PA skills (Table 3). Items 10, 11, and 12 measured one's ability to identify and match phonemes in written words, Items 13 and 14 measured one's ability to count phonemes in written words with consonant blends, and Item 15 measured one's ability to recognize what is left of a word after deleting an individual sound from that word.

Many of the first-year teachers in this sample had difficulty disentangling speech sounds from spelling. When asked to identify and match phonemes in written words when the spelling of the sound differed, most were able to correctly identify words with the same final and medial vowel sounds (Items 10 and 12). However, consonant sounds appeared to be more problematic than vowel sounds when the spelling was not transparent. When asked to match words with a common final consonant sound in Item 11, nearly one third of the participants selected words with matching final letters (*house-hose*; *of-off*) instead of sounds (*please-buzz*).

Counting sounds in words with consonant blends (i.e., two adjacent letters representing two distinct phonemes) proved difficult for half the sample. For Item 13, the proportion of teachers who incorrectly counted three phonemes in the word *grape* ($M = .49$) was similar to those who correctly identified four

phonemes ($M = .51$). Fewer teachers ($M = .39$) were able to identify that *ape*, *lake*, and *break* were arranged sequentially by the number of phonemes in each word (Item 14). These results support the confusion noted with consonant blends in Item 8 and suggest that the teachers who identified three, not four, sounds may consider the consonant sounds in the onset *gr* and *br* to be one phoneme.

Participants also had difficulty deleting a consonant sound when the spelling was not transparent. Item 15 required teachers to identify the resulting word from a list of three choices if the sound /k/ were deleted from the word *mixed*. Slightly more than half ($M = .58$) understood the correct answer to be *mist*, but a substantial proportion selected *mid*, suggesting that, besides being unaware that the letter *x* represents two sounds, /k/ and /s/, teachers were attending to the final letter *d*, not the sound /t/ of suffix *ed*. Overall, these results suggest that a significant minority of recent graduates of teacher education programs have difficulty distinguishing the sounds of speech from the letters that imperfectly represent them.

PA or Phonics?

The second question dealt with the ability to distinguish PA and phonics. Recall that

Table 3
First-Year Teacher Performance in Items Related to PA Skills

| Item | T | Certification | | |
|--|------------|---------------|------------|------------|
| | | SE | EC | EL |
| 10. Can the words <i>shoe, do, flew, and you</i> be used to illustrate oral rhyming? | | | | |
| (a) yes | .84 | .88 | .87 | .81 |
| (b) no | .03 | .06 | .02 | .03 |
| (c) only <i>you, do, and shoe</i> , but not <i>flew</i> | .05 | .00 | .04 | .07 |
| (d) I'm not sure | .08 | .06 | .07 | .09 |
| 11. An example of matching words with the same final sound is: | | | | |
| (a) please–buzz | .65 | .62 | .56 | .70 |
| (b) house–hose | .20 | .21 | .23 | .19 |
| (c) of–off | .10 | .15 | .11 | .06 |
| (d) I'm not sure | .05 | .02 | .10 | .05 |
| 12. An example of grouping words with a common vowel sound is: | | | | |
| (a) kin, fist, kind | .06 | .10 | .04 | .05 |
| (b) paid, said, maid | .07 | .11 | .06 | .06 |
| (c) son, blood, touch | .86 | .79 | .89 | .87 |
| (d) I'm not sure. | .01 | .00 | .02 | .02 |
| 13. You are helping students break a word into its separate sounds. How many sounds are in the word <i>grape</i> ? | | | | |
| (a) three | .49 | .49 | .52 | .48 |
| (b) four | .50 | .51 | .46 | .52 |
| (c) five | .00 | .00 | .02 | .00 |
| (d) I'm not sure | .00 | .00 | .00 | .00 |
| 14. Which list shows a systematic sequence in counting sounds in words, from easy to complex? | | | | |
| (a) ape, lake, break | .39 | .44 | .42 | .36 |
| (b) hop, shop, shops | .48 | .48 | .41 | .50 |
| (c) toe, bow, float | .05 | .04 | .06 | .05 |
| (d) I'm not sure | .08 | .04 | .11 | .09 |
| 15. If you said the word <i>mixed</i> without the sound /k/, you would say: | | | | |
| (a) mid | .31 | .34 | .39 | .26 |
| (b) mist | .56 | .58 | .55 | .56 |
| (c) mitt | .10 | .06 | .04 | .15 |
| (d) I'm not sure | .03 | .02 | .02 | .03 |
| Total mean score | .63 | .64 | .64 | .62 |

Note: Means are proportions correct of the maximum possible score for each item. Correct answers are in bold type. Phonic foil choices are italicized. PA = phonemic awareness; T = total sample average score; SE = special education; EC = early childhood; EL = elementary.

within the multiple-choice options for the first six items on the *Survey of Teacher PhAKS* were “phonic foils,” choices that better described phonics (i.e., using the relationships between letters and speech sounds to read and spell) rather than PA (i.e., the ability to identify and work with the sounds of spoken language). In Table 2, the phonic foil choices are italicized.

An analysis of the errors in this study suggests that a substantial proportion of first-year teachers consistently confused PA with phonics. One quarter of this sample did not understand that a phoneme represents spoken, not written language (Item 1). More than half believed that PA is “understanding the relationship between letters and sounds they represent” (Item 2); that effective PA

instruction teaches children to convert letters into sounds rather than notice, think about, and work with the sounds in spoken language (Item 3); and that the student's first lessons in PA involved learning letter-sound relationships rather than identifying sounds shared among words (Item 4). Responses to Item 6 showed that more teachers in this sample equate explicit PA instruction with reading words in the same word family than teaching letter-sound correspondences or the correct answer, choosing the word in a set of four words that has the "odd" sound. Overall, these results suggest that among the first-year teachers in this sample, differences between PA and how it differs from phonics instruction are not yet fully established.

Differences Among Certification Endorsement Groups

Research Question 3 asked if there were differences in the level of knowledge about PA, the ability to demonstrate PA, and the ability to distinguish between PA and phonics among the three certification endorsement groups. To address this question, a one-way analysis of variance (ANOVA) was used to compare the percentage of teachers for each certification endorsement group on the mean score of items relating to knowledge about PA instruction (Items 1 through 9), items relating to PA skills (Items 10 through 15), and the percentage of teachers selecting the phonic foil choices (embedded within Items 1 through 6).

Although the mean score of teachers with special education endorsement on items constituting knowledge about PA instruction (.54) was slightly higher than those with elementary certification (.52) and slightly lower than early childhood teachers (.56), there was no statistically significant difference among the three endorsement groups, $F(2, 220) = .604, p = .55$. Likewise, the mean

score on items related to PA skills of teachers with special education endorsement (.64) was slightly higher than teachers with elementary certification (.62) and equivalent to early childhood teachers (.64), but there was no statistically significant difference, $F(2, 220) = .151, p = .86$, among the three endorsement groups.

With respect to confusion between PA and phonics, reflected in Items 1 through 6, teachers with special education endorsement had a mean score of .51, indicating that about half of this sample confused PA with phonics. This mean score was higher than teachers with elementary certification (.45) and slightly lower than early childhood teachers (.52). Nevertheless, differences among the three certification endorsement groups were not statistically significant, $F(2, 220) = 1.00, p = .37$.

First-Year Teacher Knowledge of PA Instruction

Fundamental to this study is the ability of these recent graduates of teacher education programs to understand PA instruction so that they can provide it to their students. Do they understand the essential purpose of PA instruction? Are they able to choose appropriate activities that will enhance an awareness of phonemes in their students? Table 4 summarizes the first-year teacher understanding of PA instruction by certification endorsement group. Only 18% of the 223 teachers in this sample were able to correctly answer at least 12 of the 15 items (80%), suggesting that these teachers have a secure understanding of what constitutes PA instruction and are able to perform PA tasks of identifying and manipulating phonemes in words. Another 53% scored in the range of 7 to 11 items correct, suggesting an inconsistent understanding of PA instruction and ability to perform PA tasks. Nearly one third of these teachers

Table 4
First-Year Teacher Understanding of Phonemic Awareness and Its Instruction

| Certification | Level of Understanding ^a | | | | | |
|-------------------|-------------------------------------|----------|--------------|----------|---------|----------|
| | Secure | | Inconsistent | | Limited | |
| | % | <i>n</i> | % | <i>n</i> | % | <i>n</i> |
| Special Education | 17 | 9 | 60 | 31 | 23 | 12 |
| Early Childhood | 26 | 14 | 42 | 22 | 32 | 17 |
| Elementary | 15 | 18 | 55 | 65 | 30 | 35 |
| Total | 18 | 41 | 53 | 118 | 29 | 64 |

a. Secure = 12 to 15 items correct; Inconsistent = 7 to 11 items correct; Limited = 1 to 6 items correct.

correctly answered 0 to 6 items, suggesting a limited understanding of PA instruction and ability to perform PA tasks.

Current instructional practice may also affect understanding of PA and its instruction. PA instruction is known to benefit most children in kindergarten and first grade and older students who have been identified with reading problems (National Reading Panel, 2000). As shown in Table 5, of the 223 teachers in this sample, 188 (85%) reported that they provide at least some PA instruction to their students. This figure must be interpreted with caution, however, since a large percentage of these participants confuse PA and phonics. Although 20 out of 21 kindergarten teachers (95%) reported that they provide some PA instruction, only 12 (57%) report that they provide instruction four to five times weekly. A slightly lower percentage of Grade 1 teachers (92%, or 34 out of 37) provide at least some PA instruction, with 15 (41%) providing instruction four to five times weekly. As expected, a somewhat smaller percentage of teachers working with students in Grade 2 or higher (73 out of 94, 78%) provide some PA instruction.

The majority of teachers who work with students with special needs also reported that they provide PA instruction to their students. Among special educators, 52 out of 59 teachers

(88%) reported that they provide PA instruction to their students. Like Grade 1 teachers, 41% provide instruction four to five times per week. Of the five remedial reading instructors in this sample, four (80%) reported that they provide PA instruction, and they did this two to five times per week.

A 2×3 ANOVA was conducted to evaluate the effects of current instructional practice (i.e., provide or do not provide PA instruction) on the mean score of items related to knowledge for teachers in the three certification endorsement groups. A second 2×3 ANOVA was conducted to evaluate instructional practice effects on the mean score of items related to PA skills. The results for the ANOVA on items related to knowledge indicated a significant main effect for current instructional practice, $F(1, 217) = 4.89, p = .028$, partial $\eta^2 = .02$; results on items related to PA skills indicated a nonsignificant main effect for current instructional practice, $F(1, 217) = 3.68, p = .056$, partial $\eta^2 = .02$.

Discussion

The first research question investigated the level of knowledge and skills of first-year teachers initially certified in special education, elementary education, and early childhood

Table 5
Reported Frequency of PA Instruction by Certification
Endorsement and Primary Role

| Frequency | Total | Certification | | | Primary Role | | | | | | |
|------------------------|-------|---------------|-----|----|--------------|----|----|-----|-----------------|---|---|
| | | EC | EL | SE | PS | K | G1 | G2+ | SE ^a | R | O |
| Not at all | 33 | 4 | 23 | 6 | 1 | 1 | 3 | 19 | 7 | 1 | 1 |
| 1 to 4 times per month | 60 | 9 | 38 | 13 | 3 | 2 | 7 | 35 | 13 | 0 | 0 |
| 2 to 3 times per week | 61 | 13 | 35 | 13 | 0 | 6 | 12 | 27 | 15 | 1 | 0 |
| 4 to 5 times per week | 67 | 26 | 21 | 20 | 2 | 12 | 15 | 11 | 24 | 3 | 0 |
| Missing data | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| Total | 223 | 53 | 118 | 52 | 6 | 21 | 37 | 94 | 59 | 5 | 1 |

Note: The values represent number of teachers. PA = phonemic awareness; EC = early childhood; EL = elementary; SE = special education; PS = preschool; K = kindergarten; G1 = Grade 1; G2+ = Grades 2 through 5; R = remedial reading, reading, or literacy; O = other.

a. Five teachers with certification endorsement in early childhood and two in elementary education teach special education. The grade level assignments of special education teachers were not reported.

education. The 15-item multiple-choice instrument, the *Survey of Teacher PhAKS (Phonemic Awareness Knowledge and Skills)*, targeted conceptual knowledge, activities that develop PA, and the ability to match and count phonemes in written words. Those elements that were most troublesome for beginning special educators were (a) recognizing activities that fostered an awareness of phonemes, (b) understanding the content and purpose of PA instruction, and (c) identifying and counting phonemes in written words when the spellings were not transparent. Consistent with other studies of teachers' knowledge and skills (Bos et al., 2001; Mather et al., 2001; Moats, 1994; Moats & Foorman, 2003; Spear-Swerling & Brucker, 2003, 2004, 2006), only 18% of the total sample of first-year teachers were able to answer at least 80% of the items correctly. Of the 52 first-year special educators in the present study, 12 (23%) demonstrated a very limited understanding of the subject (i.e., six or fewer correct answers).

The percentage of novice teachers in this sample who could accurately segment words with consonant blends by phonemes was less

than half, a figure that is similar to the number of competent teacher-trainees reported in Scarborough et al. (1998) and experienced teachers in Moats and Foorman's (2003) study. These findings add to other investigations of teacher knowledge in spelling-sound correspondences (Bos et al., 2001; Mather et al., 2001; Moats, 1994; Moats & Foorman, 2003; Spear-Swerling & Brucker, 2003, 2004, 2006). Consistent with the teacher-trainees in the study of Scarborough et al. (1998) and the in-service teachers in the research of Moats and Foorman (2003) and Spear-Swerling and Brucker (2003, 2004, 2006), a substantial portion of the teachers in this study tended to undercount the number of phonemes in words. This pattern of responses, though, is common among mature readers.

As other investigators (Ehri & Wilce, 1980; Moats & Foorman, 2003; Scarborough et al., 1998; Tunmer & Nesdale, 1982) have shown, these findings indicate that the spellings of words influenced performance on PA tasks. Similar to Moats and Foorman (2003), phoneme matching was surprisingly difficult. Consonant spellings were more confounding than vowels or rhymes. In this study, 16% of

the teachers were confused by letter representations of final phonemes in the rhyming words *shoe*, *do*, *flew*, and *you*; 13% matched vowels by spelling, not sound (i.e., *kin–fist–kind*; *paid–said–maid*); and 30% matched consonants by orthography, not phonology (i.e., *of–off*; *house–hose*; *mixed* without /k/ is *mid*). The consonant sounds presented in these foils (e.g., /v/ in *of*, but /f/ in *off*; /s/ in *house*, but /z/ in *hose*; /t/ in *mixed*, but /d/ in *mid*) are particularly troublesome because, although they are similar in place of articulation, they differ in voicing (Moats, 2000). These findings confirm and extend Tunmer and Nesdale's (1982) hypothesis that individuals think about letters rather than sounds when doing such tasks.

The second question examined teachers' ability to distinguish between PA and phonics. A majority of the participants consistently confused PA with phonics. The error patterns on the phonic foils suggest that a substantial portion of special and general educators believe the essence of PA lies in letter-sound relationships. Almost twice as many teachers in this sample believed that the purpose of PA lessons is to learn and use letter-sound relationships rather than develop an awareness of sounds in spoken words. More than one fourth of first-year special education and more than one third of general education beginning teachers believe that reading words in the same word family (i.e., *at*, *sat*, *mat*) is an example of explicit PA instruction. Clearly, the understanding that PA develops sensitivity to speech sounds in oral language has not been firmly established in the knowledge base of these beginning teachers. Overall, these results suggest that there is considerable confusion between what constitutes PA and how it differs from phonics instruction. These recent graduates of teacher education programs could be expected to have considerable difficulty recognizing essential predictors of reading failure or engaging students in

activities designed to foster an awareness of phonemes. Furthermore, if other professionals recommend intensive PA training for students at risk for reading failure, very few special education teachers in this sample would understand what that recommendation entails.

Nearly all of the teachers in this study reported that they provide at least some PA instruction to their students, and those that do have significantly higher levels of content knowledge, but not PA skills, than do teachers who do not. In the present study, teachers who correctly answered all six items related to PA skills had significantly greater scores on items that measured conceptual knowledge about PA instruction than teachers who missed one or more items related to PA skills. This suggests that using PA may positively influence a teacher's understanding of this construct. However, the pervasive confusion between PA and phonics warrants caution in interpreting these results.

The third question in this study asked if there are differences in PA knowledge and skills or the ability to distinguish between PA and phonics among the three certification endorsement groups. Results showed no significant differences among certification groups with respect to knowledge about PA instruction, PA skills, or the ability to distinguish PA and phonics. The vast majority of teachers in all three certification groups in this sample were unable to answer correctly 80% of the items on the 15-item instrument, *Survey of Teacher PhAKS*. The data in this study also suggest that special educators are no better prepared to provide specialized instruction in PA than their general education counterparts.

These findings must be interpreted within the context of certain limitations. A primary concern of this study is the low response rate. The survey was mailed to 475 teachers. The number of respondents ($N = 223$) in this sample represents a return rate of 46.9%,

which affects the ability to generalize beyond this sample. Another limitation of this study is that it focuses on only one, albeit essential, component of comprehensive literacy instruction. Future studies are needed to determine if recent graduates of teacher preparation programs are weak in other essential components of research-based reading instruction. Nonetheless, the low performance by teachers in this sample is particularly unsettling in the era of standards-based education, the No Child Left Behind Act of 2001, and the 2004 reauthorization of the Individuals With Disabilities Education Act (IDEA), all of which instill new requirements for accountability for both teachers and students. Despite these efforts on the national and state levels to establish a set of policies and reforms designed to improve teacher learning (Wilson, Darling Hammond, & Berry, 2001), it appears that there remains substantial room for improvement in teacher preparation programs concerned with reading skills, at least in the field of PA instruction (Walsh et al., 2006).

Conclusion

In this study, a large proportion of first-year special educators and general education teachers (a) have limited understanding of what constitutes PA instruction, (b) cannot reliably distinguish PA and phonics, and (c) cannot reliably identify or count phonemes in written words when the spelling is not transparent. The focus of this study was limited to the outcome knowledge and skills with respect to PA instruction of recent graduates of teacher education programs and did not investigate the exact content of teacher education programs. It could well be that PA and other essential elements of scientifically validated reading instruction were taught as part of these teachers' education. However, results of this study suggest that graduates of teacher

preparation programs enter the profession without the requisite foundational knowledge in PA suggested by the National Council on Teacher Quality (Walsh et al., 2006). This adds to the evidence that teachers are often licensed to teach without having acquired sufficient depth of essential knowledge and skills related to beginning reading instruction (Bos et al., 2001; Moats & Foorman, 2003). Proficiency as measured by this instrument is equally low among all three certification endorsement groups.

Teaching phoneme analysis skills to teacher candidates within the context of a conventional university course is not a simple matter, though. In studies of teacher education (McCutchen et al., 2002; Moats & Foorman, 2003; Spear-Swerling & Brucker, 2003, 2004, 2006), researchers demonstrated that teachers can acquire some level of knowledge and skills in the structure of language through a combination of instruction and practice. However, teacher candidates' word reading accuracy and spelling ability can also influence their acquisition of word-structure knowledge (Spear-Swerling & Brucker, 2006), suggesting that some teacher candidates may need more time to internalize the material. In this sample, 87% of the teachers reported having at least an introduction to PA activities at least one time in their teacher education. This suggests that teacher preparation programs do provide some instruction in PA, but this information is not fully retained by the graduates. Teacher education candidates may require instruction that is more intense and explicit to fully understand PA and its instruction and to fully appreciate how PA differs from phonics instruction. Future studies that explore the amount of repetition needed by teacher candidates may be warranted.

This study also raises hard questions about reliable ways to measure PA in teachers, short of individually administered oral tests. In that many first- and second-grade children

can segment words with consonant blends, like the word *grape* (Schatschneider, Francis, Foorman, Fletcher, & Mehta, 1999), it may be that tasks involving more difficult cognitive aspects, such as phoneme deletion and showing a systematic sequence of counting sounds in words, may prove to be a more reliable way to measure teachers' understanding of PA and PA skills than simply counting sounds or tasks involving phoneme identity. Previous investigations of PA skills in teachers (Scarborough et al., 1998; Spear-Swerling & Brucker, 2003) have measured segmentation abilities by means of both indicating the number of phonemes detected in a given word and also underlining or circling the letter or letters that correspond to the individual phonemes (e.g., SH I P or S K A T E). This latter measurement technique provides more detailed information regarding the respondents' understanding of letter sound correspondences and is a methodology that is important to consider in future investigations of this nature.

Although some teacher preparation programs, textbook publishers, state departments of education, and providers of professional development courses are indeed attempting to translate research findings for teacher education, others may be making superficial changes in terminology with little change in actual content or practice (Moats, 2007; Shankweiler & Fowler, 2004). In 2006, the Colorado Reading Directorate was charged with the responsibility of reviewing and evaluating university course syllabi for all state teacher preparation programs that touched on literacy (Colorado Department of Education, 2006). Similar investigations concerning the depth of reading-related content of university teacher education curricula may be justified.

As Moats and Lyon (1996) asserted, "professors of education and special education . . . who have a thorough knowledge of language structure themselves and who are skilled

at teaching it to educators are uncommon" (p. 83). If schools of education do not sufficiently prepare teachers to provide competent reading instruction, the burden of educating teachers shifts to individual school districts (Walsh, 2006). A persisting topic for the field of teacher education is demonstration of meaningful outcomes for both content knowledge and instructional skills that correspond to state licensing standards in the field of beginning reading instruction.

Note

1. The Kuder-Richardson formula, used for dichotomously scored instruments, usually yields lower reliability coefficients than those obtained using other methods of calculating reliability (Gall, Borg, & Gall, 1996).

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