A 2020 Perspective on Research Findings on Alphabetics (Phoneme Awareness and Phonics): Implications for Instruction (Expanded Version)

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The 'Alphabetics' section in the National Reading Panel Report (NRP, 2000) covered two topics, Phoneme Awareness and Phonics, studying the research evidence regarding the roles of these domains for reading development in English. With an emphasis on beginning reading, a similar organization will be followed in this update with phoneme awareness and letter knowledge discussed in the first section (in practice phoneme awareness intervention studies almost always include both, building awareness of phonemes first). A second section will follow on the subject of phonics. In both, the implications for instruction will be discussed. Because of length limitations, and with my apologies, only representative articles about areas of study and findings will be cited, with greater focus on studies conducted since the NRP report except for questions not addressed in the same way in the panel report, in which case some older studies also are noted.

PART I. PHONEME AWARENESS AND LETTER KNOWLEDGE

For the NRP report, a meta-analysis was conducted to investigate a number of questions pertaining to phoneme awareness. The results led to the strong conclusion that phoneme awareness can and should be taught: "(*Phoneme awareness)* training benefits not only word reading but children's ability to read and spell for months, if not years, after the training has ended" (pg.2-40). In addition, they reported that, "it is essential to teach letters as well as phonemic awareness to beginners" (pg. 2-41).

In the past twenty years, the prediction of later literacy performance by early phoneme awareness and letter knowledge has been confirmed in several longitudinal studies (e.g., Hogan, Catts & Little, 2005; Kjeldsen, Niemi, Oloffson, & Witting, 2014; Vaessen & Blomert, 2010). Studies synthesizing the results of multiple studies on this topic reach these conclusions as well

(e.g., Report of the National Early Literacy Panel (NELP, 2008); Suggate, 2016). A review of phonological awareness intervention projects for children with speech or language impairments likewise indicated positive benefits (Al Otaiba, Puranik, Ziolkowski, & Montgomery, 2009; Gillon, 2010). Further, reciprocal benefits of phoneme awareness for learning how to read and of phonic skills for augmenting phoneme awareness were noted in the NRP report and have been confirmed since (e.g., Clayton, West, Sears, Hulme, & Lervåg, 2020). Using a mediation model[1] to evaluate the results of an intervention study, Hulme, Bowyer-Crane, Carroll, Duff, and Snowling (2012) determined that "the development of children's word literacy skills is causally influenced by children's early letter knowledge and phoneme awareness," strengthening the case that these two skills should be directly taught to all beginning readers. In sum, the convergent research evidence for the importance of phoneme awareness and letter skills is indisputable.

The explanation for the importance of phoneme awareness and letter skills is as follows: The learner of a writing system (i.e., an orthography) has to understand that sounds units in the spoken language are represented by written symbols. For example, for writing systems that are syllabaries (see https://omniglot.com/writing/syllabaries.htm), the learner has to be aware that spoken words are comprised of syllables. For systems that are alphabetic, the beginner has to first become aware of individual phonemes in spoken words in order to subsequently learn that those phonemes are represented by letters. Fostering phoneme awareness before introducing letters is advised because it allows focus on the spoken form of phonemes, avoiding confusion with visual letters or letter names. Once the beginner has solid awareness of some phonemes, the representation of them by letters can be introduced with continuation of the staggering of phoneme awareness and letter knowledge as students discover more speech sounds. This sequencing provides students with a necessary understanding of how the alphabetic writing system works, referred to as 'the alphabetic principle'.

Increased phoneme awareness by a child also has been suggested to influence how words are represented in the child's internal lexicon. In terms of how words are processed and represented in the brain, it is thought that young children initially have somewhat global representations of how words are pronounced (i.e., phonological representations). As their vocabularies grow, global representations become less efficient and more economical phonemic representations

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[1] Mediation models allow investigators not only to test if an intervention is effective, but to evaluate the particular factors responsible for the outcomes obtained.

begin to be established for pronunciation information (e.g., Fowler, 1991; Metsala & Walley, 1998). The brains of children (and adults) also have semantic representations about the meanings of words. In literate societies, there is a third level of representation possible: with the development of phoneme awareness and letter knowledge (and additional phonics skills), the formation of orthographic mappings of how these correspond specifies the spellings of words, often described as orthographic representations. Importantly, orthographic representations enable rapid word recognition during reading as reading skills increase (e.g., Ehri, 2005). In sum, phoneme awareness supports understanding what letters represent and is a factor in the specificity of phonological and orthographic representations in the brain. Because learning grapheme knowledge in turn strengthens phoneme awareness and is pivotal to the establishment of orthographic representations and reading, phoneme awareness programs should integrate this area of skill, following a coordinated sequence of introduction.

Reviewing Why Phoneme Awareness is a Challenging Skill to Acquire.

When a person says a word, the articulation of the phonemes overlaps to some extent. Because phonemes are produced with combinations of oral gestures (e.g., lip closing, tongue raising against the roof of the mouth, lip rounding, jaw raising or lowering) and gestures lower in the throat (e.g., vocal cord vibration), an individual phoneme can be described as the set of gestures required to say it (Fowler, Shankweiler, & Studdert-Kennedy, 2016). In turn, the gestures have different timings during the production of a given phoneme; some gestures extend into the phoneme before and/or into the following phoneme. This creates what is termed co-articulation, with more than one phoneme being produced at a time, at least in part. To get a feel for this, consider what your lips are doing when you say the /s/ at the beginning of "Sue"; the rounding of the lips for the following vowel overlaps with the hissing produced by expelling air from the lungs between the roof of the mouth and the tongue. In contrast, the lip position at the beginning of "see" is not rounded, but instead the lips are pulled back in a wide /i/ pattern. Thus the production of spoken phonemes is not entirely separate and sequential, but has elements of neighboring phonemes as well, altering the sounds of phonemes somewhat depending on which phonemes precede or follow. As a consequence, coarticulation contributes to the challenges of becoming aware of individual phonemes. Further, the fact that young children are accustomed to

attending to the meaning of what is being said, and for awareness purposes have to concentrate instead on the sounds in words, adds to the difficulty of developing awareness of phonemes.

Clarifying the terminology.

The words containing 'phon' can be confusing and too often are misused. In order to aid relaying accurate information about the implications of research findings, I will discuss three words central to the topic at hand: phonological awareness, phonological sensitivity and phoneme awareness.

Awareness Terms:

Phonological awareness is an umbrella term that refers to awareness of sound structures in spoken words. This means the listener is able to consciously notice speech sounds within the word, whether large chunks of sound such as rhymes or each of the individual phonemes. This term encompasses the two concepts described below.

Phonological sensitivity[2] entails the larger and more salient units of speech sounds in words:

1) *Rhyme pairs* in which the words share the stressed vowel and all the speech sounds that follow in the words (as in one-syllable words (e.g., m*e*, s*ea*) or rhymes that extend across more than one syllable (e.g., m*ountain,*f*ountain);*

2) *Onsets* that consist of the speech sounds before the first vowel in a word (e.g., the /b/ in *b*at or the /sp/ in *sp*aghetti);

3) *Syllables*, each of which has a spoken vowel around which there may or may not be consonants, as in the words *fan-tas-tic* and *pi-an-o*.

Another speech unit that often is mentioned is the *rime*; rimes are defined as a subdivision of syllables, not of words. The rime is what follows the onset in the syllable. Thus, in a one syllable word such as 'stop', /op/ is the rime, whereas in a multisyllabic word such as 'mister', *each* syllable has an onset and a rime. In this case, the rime for the first syllable in 'mister' is /is/

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[2] Stanovich in 1992 proposed phonological sensitivity as the umbrella term; in 1999, Torgesen and Mathes emphasized 'phonological sensitivity' as descriptive of the early stage and phoneme awareness for the higher level required for reading skills. Having the same term to encompass all levels (i.e., whether using phonological awareness or phonological sensitivity as the umbrella term), and to also describe one of the lower levels invites confusion and contributes to misinformation. The labeling used here with unique labels for each avoids this problem.

and for the second syllable is /er/. In words with only one syllable, the rime and rhyme elements are the same (as for 'stop'), whereas in multisyllabic words they are not (the rhyme section of the word 'mister' is /ister/, rhyming with 'sister'). The fact that the words rhyme and rime are pronounced the same and are in fact identical in one-syllable words has, I believe, contributed to misunderstandings about the development of phonological awareness.

Phoneme awareness (alternatively called phonemic awareness) refers to conscious awareness of the individual phonemes in spoken words, in contrast to the subconscious processing that occurs when we hear words. In English there are approximately 44 phonemes (depending on the dialect); in other languages the number varies from many fewer (e.g., Hawaiian has 17) to far more (e.g., the Taa language spoken in Botswana and Namibia has more than 100 consonants and 44 vowels, much more fully drawing on the set of phonemes the human vocal tract is capable of producing). A critical task for the child or adult learning to read and spell an alphabetic writing system is to become consciously aware of each of the phonemes in the individual's spoken language, or, for the second language learner, to become aware of each of the phonemes in the second language, including those not in the student's native language. To be able to help students with these tasks, teachers of course need to be well informed about the phonemes in the spoken language and it would assist second language learners if their teachers were aware of which speech sounds are challenging depending on the child's first language (see Honig, Diamond, & Gutjohn (2000): Core Teaching Reading Sourcebook (2000), pgs. 4.24-4.27, for lists of which English phonemes often are harder for English language learners, depending on the learner's native language).

To avoid confusion when talking or writing about phoneme awareness, educators are advised to use that term, rather than the umbrella term, phonological awareness, and also to be specific when discussing phoneme awareness versus phonological sensitivity.

Further Cautions about the Use of 'Phon' Terminology.

Other words or labels that have 'phon' as part of the words sometimes are used to talk about phonological awareness concepts, when they actually have different meanings pertaining to characteristics of languages (e.g., phonology), reading instruction (e.g., phonics), speech production (e.g., phonological processes), or how speech is processed below conscious awareness in the brain (e.g., phonological processing) (see Scarborough & Brady, 2002, for a

glossary of terms for talking about speech and reading). This misuse, of course, muddies communication and contributes to misunderstandings. To be fair, some of the confusion stems from differences in terminology in different fields and because the use of terms has evolved as more is learned. Yet, because of the variability in use, when reading about a research study or a program, generally it is necessary to check the tasks administered to ascertain what the study actually investigated or to determine what the program really targets. With improved use of terms, the situation would improve, helping individuals better understand what phoneme awareness, the critical level for learning to read, entails.

In this article, I will use the terms as defined above to discuss the results of studies and other topics pertaining to these three constructs.

Is it Necessary to Teach Lower Levels of Phonological Sensitivity before Teaching Phoneme Awareness?

A commonly adopted view about phonological awareness development has been that young children progress from awareness of syllables, to awareness of the onsets and rimes within syllables, and that children subsequently achieve awareness of the individual phonemes (e.g., Goswami & Bryant, 1990; Treiman & Zukowski, 1991). This has been taken as the course of phonological awareness development, leading to the practice of teaching phonological awareness in that sequence. However, a number of findings point to problems with this framework. For example, phoneme awareness does not appear to be the final phase in a natural development of phonological awareness abilities. In cultures not having the benefits of literacy, phonological sensitivity skills have been documented, but not full awareness of phonemes, even by adulthood (Morais, Cary, Alegria, & Bertelson, 1979). Rather, gaining phoneme awareness appears to require instruction for most. A study supporting this point compared phoneme awareness skill development over a year for two groups of young children differing very slightly in age (i.e., by a month or two): a group of slightly older five-year-olds that started school at the outset of the study and a group of slightly younger children that did not (Bentin, Hammar, & Cahan, 1991). Large gains in phoneme awareness were documented at the end of the school year only for those children who had spent the year in school engaged in reading and reading-related activities, pointing to the role of instruction.

Although phonological sensitivity skills can be taught to young children as part of an extensive phonological awareness program that culminates in phoneme awareness (e.g., Lundberg, Frost, & Petersen, 1988), it is not clear that doing so improves acquisition of phoneme awareness or is necessary. A key test was conducted to examine whether students who have not yet learned how to segment syllables can be taught to identify and segment phonemes (Cary and Verhaege, 1994). In this study, in one condition, Portuguese kindergarten children from low-SES circumstances who were taught to segment and blend syllables still could not do so with phonemes. One might expect that additional instruction would be necessary to achieve phoneme awareness. On the other hand, a comparison group of children was successfully taught to segment and blend phonemes, despite not having been able to segment and blend syllables at the outset, and these students also acquired syllable awareness without having had instruction in that construct. The take-away is that having syllable-level skills was not required for the development of phoneme awareness. Thus, an important implication is that it is not necessary for teachers to devote the time and effort to foster skills in phonological sensitivity in order for children to acquire phoneme awareness. Additional research findings raise doubts about the Syllable-Onset/Rime-Phoneme theory of phoneme awareness development: preschool children in fact are more sensitive to rhymes and word onsets than they are to syllables and sub-syllabic elements (syllable onsets and rimes) (e.g., Gipstein, Brady & Fowler, 1999; also see Carroll, Snowling, Stevenson, & Hulme, 2003; Chafouleas, Lewandowski, Smith, & Blachman, 1997; Savage, Blair, & Rvachew, 2006).

Further, in the U.S., at least two very effective phoneme awareness programs have been designed and implemented with kindergarten students that deliberately avoid attention to phonological sensitivity activities with rhymes, syllables or onset-rime, and instead target phoneme awareness (e.g., Blachman, Tangel, Ball, Black, & McGraw, 1999; Lindamood & Lindamood, 1998). Blachman and her colleagues used a 'Say It and Move It' technique in which children are to say a word slowly, focusing on individual phonemes within the word and placing tokens to signify each phoneme in a left to right order. Once a student successfully segments phonemes in one-syllable words with simple syllable structures, letter tiles are gradually added, successfully teaching the alphabetic principle within the context of phoneme awareness instruction. The program introduced by the Lindamoods, the LiPS program, incorporated attention to articulatory information, first teaching articulatory movements, then shifting to

awareness of the phonemes produced by those movements, and next teaching sound-letter associations. Several studies have documented the efficacy of this method (e.g., McIntyre, Protz, & McQuarrie, 2008; also see Castiglioni-Spalten and Ehri (2003) for further evidence of the value of articulatory instruction for developing phoneme awareness and possibly for facilitating phoneme-grapheme connections.) Programs such as Blachman's Road to the Code (2000) (using 'Say It and Move It') and LiPS are conducive to one-to-one pairing of phonemes and letters and intersect well with further systematic phonics, spelling, and handwriting activities. The success of these approaches underscores that phoneme awareness is a realistic kindergarten goal. In turn, the phonological sensitivity activities that have been thought by many to be suitable for kindergarten actually are appropriate for preschool (see Figure 1 for an outline for teaching phonological sensitivity and phoneme awareness, as well as phonics, from pre-K through second grade).

Insert Figure 1 here.

A further point pertains to children coming from lower socio-economic circumstances who have been documented to enter school in kindergarten with lower attainment of phonological awareness abilities. For example, Lonigan, Burgess, Anthony, and Barker (1998) reported that children from a lower-income sample (ages 2 to 5 years) "generally performed substantially lower than children from the middle-income sample" on phonological sensitivity and phoneme awareness measures (pg. 26). If it were necessary to follow a progression from larger phonological sound structures to smaller, the implications for children entering with lagging or weak skills would be a longer and/or more intensive timeline of instruction in order to achieve mastery of phoneme awareness. If instead it is possible to successfully launch kindergarten instruction at the phoneme level for children who enter with lower phonological sensitivity, as the 'Say It and Move It' and LiPS methods described above have done, doing so would make a meaningful difference in the rate of reading development of those students. Blachman et al. (1999) achieved noteworthy gains with low-income, inner city children who were given phoneme awareness and reading instruction in kindergarten (and continued through first grade and, for some, into second grade). Focusing here on the results of the kindergarten year, the

group of students who received explicit instruction in phoneme awareness and letter knowledge significantly outpaced control participants who were given the regular kindergarten school curriculum (also see Ukrainetz, Nuspl, Wilkerson, & Beddes (2011) and Yeh & Connell (2008)). Finally, instruction in phonological sensitivity skills may have limited long-term benefits for later reading and spelling development (e.g., Nancollis, Lawrie, & Dodd, 2005), in contrast to the benefits resulting from intervention at the phoneme level (e.g., Gillon, 2002; Kirk & Gillon, 2007).

So, one might ask, why is the focus on phonological sensitivity instruction widespread in published kindergarten and first-grade reading programs in the U.S. with limited attention to phoneme awareness? One explanation is that the sequence of the development of phonological awareness abilities observed in young children led to a mistaken, though understandable, assumption that a child cannot reach a later skill without having mastered earlier ones. A second explanation is that since the NRP report was released there has been pushback in mainstream education about adopting evidence-aligned methods of instruction in phoneme awareness and phonics, with discomfort about focusing on phonemes. This has contributed to *tokenism* (Brady, 2020). In this instance, tokenism has been illustrated by programs that spend more time teaching phonological sensitivity for larger speech segments and insufficiently cover phoneme awareness skills, while claiming to have provided instruction on phonological awareness. Yet, make no mistake: it is phoneme-level awareness skills that directly support learning to read and spell. Thus, the bottom line is that the necessity of proceeding in kindergarten and first-grade from phonological sensitivity instruction to phoneme awareness instruction is not supported: the rationale for doing so appears to be faulty. Instead, teachers in these grades should target student mastery of phoneme awareness (Gillon, 2018). If a district persists in focusing primarily on larger syllable, rhyme, or onset-rime structures in the kindergarten year, it will slow students' development of reading skills. Likewise, if postponed phoneme awareness goals are covered incompletely in subsequent grades, this is likely to further impede many students' reading and spelling development. On the other hand, if phoneme awareness goals are targeted in kindergarten, the goals can be attained with fun and engaging activities, and in turn will benefit learning to read by all students.

Is There a Sequence of *Phoneme Awareness* Development?

For young students, the location of a phoneme in a spoken word influences how easy it is be aware of that phoneme. In brief, phoneme awareness development can be summarized as typically progressing from awareness of *external phonemes* at the beginning of words, followed by those at the ends of a words, to advanced awareness of *internal phonemes*: first the medial vowel in a CVC (i.e., consonant-vowel-consonant) item, followed by ability to segment and identify the internal consonants in consonant clusters (or blends). (See Figure 2 for examples.) One of the most informative indications of this sequence of development comes from students' invented spellings and their spelling errors for words they have learned. Simply put, if a speech sound is not represented in the spelling of a word, it is a flag that the child may not be aware of that phoneme in the spoken word. The early beginner may just put a single letter, B, for butterfly, indicating, at least in part, that the child could isolate and identify the first phoneme but not the following phonemes. A later spelling might be 'bd' for bed, with the final stop consonant included, but not the medial vowel. Ehri (1994) refers to this as a partial phonetic phase of spelling and reading; not all speech sounds are included. As students progress, normally-developing readers often have difficulty with consonant blends, having trouble isolating and identifying the internal consonant in a blend, in part a consequence of the extent of coarticulation in blends. Thus one often sees errors such as 'jup' for jump, 'wet' for went, and 'sop' for stop (see Moats, 1995, for discussion). For young students and older struggling readers, omission of the internal r and l letters in blends are highly common (e.g., 'pan' for plan, 'pinsos' for princess), indicating ongoing difficulties with phoneme awareness of the absent speech sound. Of course there are many spelling errors that reflect incomplete learning of the orthographic patterns (e.g., as in other aspects of the misspelling of *princess* above or writing *boil* as 'boyl'). Thus educators need to be able to sort out which stem from phoneme awareness, which from orthographic patterns, and how to identify and assist with each (Moats, 2020). Phoneme awareness weaknesses also are evident in reading errors. For example, the reading errors for words and nonwords during assessment of a 9-year-old with reading difficulties largely occurred on items that have consonant clusters with either an /r/ or an /l/ or another phoneme such as /n/ (i.e., 'guild' for glide; frip for flip; 'sluke' for snunk) (Brady, 2007). These kinds of errors in spelling or reading are indicative of a need for phoneme awareness activities to address a student's ongoing problem with awareness of internal consonants for particular speech sounds.

The frequency of these kinds of spelling errors in the mid-elementary grades suggests that phoneme awareness curricula are insufficiently targeting and verifying this final level of phoneme awareness development that should be a first-grade goal.

Insert Figure 2 here.

Evidence of this sequence of development generally is not observed in research studies on phoneme awareness because the selections of assessment measures often have not systematically assessed awareness of the external and internal phonemes in simple and complex syllables (though see studies of spelling development (e.g., Bourassa & Trieman, 2001)). Data from an unpublished professional development project carried out with Evelyn Russo and Claire Davis (2009-2010) illustrates the emergence of early phoneme awareness skills in the fall scores for 162 students who had just begun kindergarten: 54 students were able to reliably identify the first phoneme in spoken words, 17 of those were also able to identify the final phoneme, and a subset of 8 were able to identify medial vowels in CVC words as well; the remaining 108 were not yet consistently able to isolate and identify even initial phonemes. By the end of the school year, following instruction on identification and segmentation of phonemes that was differentiated to meet students' levels of development, 91% of the students were proficient at identifying initial, final, and medial phonemes in CVC words and 85% were accurate at segmenting words with simple CVC structures. (The project was one year long; to continue instruction, a developmental sequence of phoneme awareness instruction building on this progression in first grade (c.f., Blachman et al., 1999) would be appropriate to ensure that awareness of all phonemes of spoken English is achieved, that these are coordinated with grapheme patterns, and that the awareness of phonemes in consonant clusters is attained. See Figure 1 for an overview of components of phoneme awareness taught in kindergarten and first grade.)

 As noted earlier, activities that focus on phonological sensitivity awareness (rhymes, word onsets, syllables) are recommended for activities in pre-school, not as part of a kindergarten curriculum. In Part II of this article, incorporating activities with word families (e.g., heat, seat, meat) and syllables will be discussed as relevant instead for orthographic skills in the first and second grades.

A final comment is that publishers of programs for phoneme awareness development are advised to include resources for teachers about the speech sounds in English and the graphemes that represent those phonemes in light of the fact that these topics are not covered sufficiently in many schools of education that prepare teachers (Binks-Cantrell, Hudson, Han, Moore, Koh, & Joshi, 2020).

Which Kinds of Tasks are used for Assessment of Phoneme Awareness?

A number of different types of spoken tasks have been used to assess students' phoneme awareness skills. Before addressing the relative importance of these skills in the early grades for reading development, and evidence as to whether they are a cause or consequence of reading ability itself, the tasks will be briefly described.

Isolating and identifying phonemes: (e.g., "What is the first sound in *pot*"; "Does *man* start with the same sound as *mice*?), progressing to different positions in words as listed in Figure 2.

Segmenting phonemes: (e.g., Say each of the speech sounds in *pan*), advancing from simple syllables (CV, VC, CVC) to complex syllables with consonant clusters (CCVC, CVCC, CCVCC).

Blending phonemes: (e.g., What word do these sounds make if you put them together: /b/ - /ē / - /d/?), progressing from simple to complex syllables, as students are ready. Blending often is an early skill, in all likelihood because the student does not have to segment and identify the phonemes in the word, but only has to combine them. (This is akin to it generally being easier to read a word than to spell a word.)

Manipulating phonemes: This term has been used by some researchers, particularly in earlier years, to refer to segmenting and blending, presently it is more frequently used to refer to deleting a phoneme in a spoken word, and sometimes to substituting one phoneme in a word for another or reversing the order of the speech sounds. Below examples of deletion are provided as this task is a common manipulation task used.

> Deleting phonemes (also called elision) (e.g., Say *meat*, say *meat* again without the /m/.)
> Once again the task can be at an easier CVC level or can be harder with complex
> syllables (e.g., removing an internal consonant in a blend: Say *steak* without the /t/.)

It is important not to confuse the task with the level of phoneme awareness development. As mentioned, each of the tasks can tap lower levels of awareness with words with simple syllable

patterns (CV, VC, CVC) or at higher levels with the complex syllable patterns. Thus, it would not be appropriate to describe a deletion task in which the student is told to say *bee* without the /b/ as requiring advanced phoneme awareness.

How Does Orthographic Knowledge Impact Assessment of Phoneme Awareness?

When experienced adult readers perform phoneme awareness measures, they reveal the effects of orthographic knowledge. For example, Castles, Holmes, Neath, & Kinoshita (2003) demonstrated that adult readers find it easier to delete phonemes from spoken words in which there is a direct correspondence between the letter and the targeted speech sound (e.g., delete the /f/ from rafter) than when there is not a straightforward correspondence (e.g., delete the /s/ in fox). Further, they documented that adults cannot inhibit orthographic activation of the spelling, even when they realize it makes the task more difficult, although they can endeavor to focus their attention on the speech sounds. As skilled readers get older, they increasingly rely on spelling knowledge and often are inaccurate on phoneme awareness measures (Scarborough, Ehri, Olson and Fowler, 1998). This lack of awareness also has been found to be true for teachers of reading, underscoring the need to provide training on the phonemes of English and on awareness of them in spoken words via professional development, and, preferably, as part of initial part of the preparation of future teachers (Moats, 1994).

The reason for the impact of spelling knowledge on phoneme awareness performance appears to result from the effects of orthographic knowledge on speech perception. There are two possible explanations at this time: first, studies suggest that processing speech, as when one hears a word, either may automatically activate the associated orthographic representation for that word or, second, when one learns how to spell a word that this may modify the phonological representation for that word, leading the representation to incorporate spelling information and have more phonemic detail (see Kolinsky, Pattamadilok & Morais (2012) for discussion). Whichever is the case, when doing a phoneme awareness task, the spelling information for that word would be automatically tapped for readers and, as a result, reading achievement is likely to influence performance on the task. In terms of reading prowess, the conjoining of information about phonological and orthographic representations is no doubt beneficial. However, when assessing phoneme awareness, one can argue that performance by readers, younger or older, is influenced by orthographic knowledge, especially for measures such as deletion with greater

memory demands. Thus, performance on deletion tasks will yield strong correlations with reading achievement and could be said to be more a measure of reading acquisition than of phoneme awareness per se, raising questions about its utility. At the least, educators should be on the lookout for errors that indicate reliance on spelling information (e.g., saying that short e is the last sound in *give* on a segmentation task when the e is silent), indicating a need to redirect the student to attending to the speech sounds, and practitioners are advised to use word and nonword items that do not support a spelling strategy for identifying phonemes in which the number of letters differs from the number of phonemes (e.g., how many speech sounds are in the word *sign?*).

Choosing Which Phoneme Awareness Skills to Target.

The different phoneme awareness tasks appear to have varying relationships with emerging reading and spelling skills over time. Researchers have proposed that phoneme awareness is explicit knowledge of phoneme identities in spoken words and hence a critical skill associated with establishing the alphabetic principle (e.g., Byrne & Fielding-Barnsley, 1990). In the NRP report, large benefits were reported for studies that taught blending and segmenting skills at the phoneme level. One can argue that segmenting words helps children build decoding and spelling skills and that blending supports synthesizing decoded phonemes into words. A study by Murray (1998) investigated all three of these phoneme awareness skills: the design was to train one group of kindergarten students on phoneme identity and a second group on blending and segmentation. The group trained on identity made significantly better gains on partial phonetic reading of words with the initial phonemes that had been taught, but did not improve on blending or segmenting. In contrast, the group trained on blending and segmenting improved on those skills, but not on phoneme identity. This suggests the truism that what is learned hinges on what is taught, and that there are separate skills that make up phoneme awareness expertise.

In a longitudinal study that spanned several years, Yopp (1992) used statistical techniques that allowed her to examine the directions of influence between phoneme awareness and reading achievement, not merely focusing on simple correlations that do not shed light on causality. She found that the relationships between specific phoneme awareness measures and achievement in reading varied and that the directions of influence for some measures differed at different time points. Her results pointed to the importance of simple phoneme awareness skills in

kindergarten (i.e., phoneme blending, counting phonemes, and phoneme isolation/identification) for early reading gains. Noteworthy results for three measures are elaborated here for the early grades: Blending measured at the end of kindergarten was a significant predictor of reading ability at the end of first grade; likewise blending performance at the end of second grade again predicted reading achievement in third grade, after which it no longer predicted subsequent reading development. Segmentation ability had a reciprocal relationship with reading attainment from kindergarten through third grade, indicating both that segmentation skill contributed to reading ability and that reading skills likewise facilitated segmenting. Deletion skills follow initial reading skills, resulting from reading development during the first grade, significantly predicted second grade reading achievement between grades one and two, and in the grades after that again were explained by reading achievement. Thus, it seems that deletion skills for the most part are the *consequence* of learning to read, that is, better readers do better on such skills because they can draw on orthographic knowledge, as noted earlier. In turn, getting faster at performing deletion tasks is likely to reflect increasing orthographic skills. I am inclined to think that the value of deletion (and substitution) activities would be better provided through writing tasks that systematically progress through the stages of the orthographic patterns targeted (i.e., simple syllables before complex patterns), enhancing both phoneme awareness and spelling knowledge (see discussion of research by McCandless, Beck, Sandak, & Perfetti (2003) in Part II on phonics).

My conclusion about which phoneme awareness measures to target is that teachers can be informed about their students' phoneme awareness needs by analyzing their progress on the sequence of phoneme awareness development (external/internal phoneme awareness) with phoneme identification and segmentation tasks using one-syllable words/nonwords and by noting if spelling and reading errors provide evidence of phoneme awareness weaknesses, as mentioned earlier. Thus what to focus on should be guided by documenting where students are in the development of phoneme awareness skills and selecting activities that systematically drawing attention to the next level needing work. For example, for students who have solid awareness of phonemes in initial position, but who are not reliably accurate on final position, that position would be the next goal for those students. Phoneme segmentation and identification at each of the levels should be smooth and fairly effortless before proceeding to the next level.

In sum, identification, blending and segmenting skills are key phoneme awareness skills to foster in the early elementary grades, with the possible addition of deletion activities in first grade, particularly through writing tasks. With older students who are struggling with reading development, assessment of their phoneme awareness abilities would help determine how complete their phoneme awareness skills are and if not, at what level to begin further support.

Summary: Phoneme Awareness and Letter Knowledge

A number of instructional recommendations are informed by the research topics discussed here.

1. Phonological awareness instruction in kindergarten should concentrate on early phoneme awareness, not on phonological sensitivity. Note that the NRP report centered on the importance of phoneme awareness, not on phonological sensitivity. Results since the report was published support that conclusion (see Gillon, 2018). The widespread adoption of lower phonological sensitivity goals in kindergartens in the U.S. needs to change to phoneme awareness goals to help students make timely and important progress in learning to read. *Phoneme identity* skills are important to attain in kindergarten, focusing first on the external phonemes in CVC words (the initial phoneme, followed by the final phoneme) and progressing to the medial vowel. In addition, *blending* and *segmentation* activities should be conducted with CV, VC, and CVC words. Students will vary in their rates of progress; accordingly, there should be periodic monitoring of student progress and differentiation of instruction to align with students' extent of phoneme awareness development. Teaching students in homogeneous, small groups is effective (Gillon, 2018).

2. Phoneme awareness instruction in first grade should continue the sequence of instruction, ensuring that students are able to identify each of the phonemes of English, that is, the remaining consonants and vowels in the language beyond those taught in kindergarten, including diphthongs, remaining consonant digraphs, etc. Phoneme awareness blending and segmentation skills, after mastery with CVC words, now should extend to the next phase of phoneme awareness development: the internal consonants in consonant blends in words with complex syllable patterns. In addition, deletion skills with writing activities would be beneficial. Once again, monitoring of students' progress and differentiation of instruction should be done.

Questions arise as to the over-all duration of a phoneme awareness curriculum. In the NRP report, relatively short time spans for effective programs were noted, providing reassurance that adding phoneme awareness into the curriculum need not be burdensome. However, the goal should be to build mastery for all of the specified levels for all students, providing extra sessions and continuing instruction on phoneme awareness for those students who are making slower progress, continuing beyond first grade for some students, if needed to ensure mastery.

3. Phoneme awareness instruction should be integrated with letter instruction. Teaching phoneme awareness for a set of individual phonemes should be followed by instruction in the corresponding letter(s) when phoneme awareness as a listening activity is well established for those phonemes. This order helps clarify for students that phonemes are elements in spoken words and that letters are how those speech sounds are represented in writing (i.e., the alphabetic principle). As discussed earlier, the NRP report and subsequent studies have confirmed that linking phoneme awareness with letter-sound knowledge strengthens the application of phoneme awareness for improved reading and spelling performance.

PART II. PHONICS

Findings of the NRP

The effects of phonics instruction were studied for the NRP report, again by carrying out a meta-analysis. The results indicated that systematic phonics instruction yielded better reading gains than did all of the types of nonsystematic or nonphonics instruction provided to comparison groups (i.e., basal programs, whole language approaches, regular curriculum, whole word curriculum, and miscellaneous programs). In addition, systematic phonics was documented to be effective whether taught through individual tutoring, in small groups, or to the whole class.

The benefits for reading achievement were the greatest when students had received phonics instruction during kindergarten and first grade. Positive effects also were reported for later grades, although the magnitudes of the gains were smaller overall. Likewise, phonics instruction was shown to produce strong growth in kindergarten and first-grade students who were at risk for later reading difficulties, as well as for the reading achievement of older, disabled readers with average IQs but low reading achievement. (However, there were not significant effects on the reading attainment of low-achieving readers in grades 2-6 for students with reading

weaknesses who may have had other cognitive weaknesses in addition that contributed to their low achievement.) Notably, children at all socio-economic levels (SES) made better gains in reading when provided with systematic phonics instruction.

Yet, comparisons of three different types of phonics instruction did not yield significant differences in the reading achievement of students. These were: a) synthetic phonics programs that emphasized teaching students to convert letters (graphemes) into sounds (phonemes), and then to blend those sounds to form words; b) larger-unit phonics programs that targeted the analysis and blending of larger phonological subparts of words (e.g., onsets and rimes in word families); and c) miscellaneous programs that taught phonics in other ways but did not sufficiently describe the features of the methods. All three resulted in statistically noteworthy gains, but were not found to differ significantly from each other.

The members of the NRP concluded that the results of the analysis indicated the positive value of including systematic phonics programs in today's classrooms. As discussed in the previous section, they also underscored the need for children to be aware of the phonemes in spoken words in order to appreciate the significance of letter-sound correspondences. Further, they emphasized the importance of programs having an appropriate balance between teaching phonics concepts and having practice applying those concepts in daily reading and writing activities.

Since the NRP report was published in 2000, there has been increased research support for teaching explicit, systematic phonics, as well as pushback from mainstream education (see Brady, 2020; Seidenberg, 2013). The goal here is to focus on research knowledge about phonics instruction accrued since the NRP report, with occasional reference to studies conducted prior to 2000 as pertinent.

Dimensions of Phonics Instruction

Before beginning the discussion of newer research findings, variations in parameters of phonics instruction will be briefly described.

Unit Size. This refers to the size of the element targeted for reading instruction. Smaller linguistic units are used to teach the grapheme-phoneme correspondences (GPCs) in words (e.g., bat: b-a-t), whereas larger units (onsets and rimes, e.g., c-ake, b-ake) in word families are a different focus that has been used.

Degree of Explicitness. Programs that are more explicit foster discovery of orthographic patterns and give explanations of when particular patterns are used (For example, instruction on the main types of vowel syllable patterns provides contextual strategies for knowing how to read or spell words (see Figure 1). On the other hand, approaches that are less explicit include examples of phonics patterns in texts, but children's attention is not drawn to the nature of patterns nor to the spelling contexts in which they occur.

Degree of Systematicity. Programs that are more systematic cover a planned set of lessons that start with regular spelling and decoding patterns, beginning with a set of consonants (chosen based on frequency and regularity) and regular, single-letter vowel patterns. Some high frequency words are taught in tandem with the phonics content to support reading and writing of connected text. Patterns are gradually added, building on what has been learned, and increasing accuracy and automaticity. Systematic sequencing more often occurs with grapheme level instruction, but can follow a planned sequence with a word family approach (e.g., Santa & Hoien, 1999).   The least systematic approaches rely on incidental instruction when a child struggles with reading a word. This version of code instruction sometimes comes under the labels *embedded phonics* or *phonics in context* in which cases a phonics cue might be given after nudging the child to use other strategies (that is, to guess based on the context; to look at the picture).

Scope and Duration. Programs that have a broad scope of phonics instruction usually span multiple years, extending from initial letter-sound correspondences, expanding to all of the grapheme-phoneme patterns, including instruction on orthographic patterns (e.g., syllable types, syllable division strategies, morpheme patterns) and additional spelling rules such as when to double consonants and when to drop "e" when adding a suffix. In contrast, whole-language programs have a minimal scope in which mainly consonant-letter sound patterns are taught in kindergarten and first grade with little focus on other phonics concepts.

Types of Activities. A distinction has been made between so-called *synthetic phonics* and *analytic phonics*. With synthetic phonics, students are encouraged to identify the sounds represented by the letter in each position of the word and then to blend those sounds together, forming the word. In contrast, analytic phonics approaches teach reading by giving students sets of words that share the beginning onsets (house, hat, hen) or ending rime sequences (bean, mean,

lean). This analytic approach primarily teaches onset and rime units, avoiding analyzing words into all of the individual phonemes.

The characteristics of phonics programs usually cluster, with more explicit instruction tending to focus on GPCs with more systematic and cumulative instruction, a more thorough scope requiring a longer duration, and synthetic activities. This combination entails several of the features of *structured language* approaches (Moats, 2020). On the other hand, less systematic instruction generally uses more embedded approaches that target onset-rime elements, minimize the scope/duration of phonics instruction, and utilize analytic activities.

Phonics Research Since the NRP Report

In the two decades since the NRP report was published, a number of meta-analyses evaluating the effect of phonics instruction have been conducted, incorporating studies from multiple decades. To briefly review, the purpose of meta-analyses is to combine a set of individual studies on a single topic in order to get a precise estimate of an outcome, in these cases of the effects of different kinds of phonics instruction. However, the studies have to be similar enough in design, participants, timing, and content so that a combined estimate will be meaningful and there needs to be a sufficient number of studies that meet these criteria. In recent years, two reviews of meta-analytic studies of phonics instruction have been published. In 2017, Savage and Cloutier conducted a narrative review of nine meta-analytic studies of the efficacy of phonics, reaching the general conclusion that there are positive effects for synthetic phonics interventions. In a second review, this time focused on the issue of whether systematic instruction with synthetic phonics is more effective than analytic methods of reading instruction, Bowers (2020) raised concerns about the combinations of studies included in 11 meta-analyses and questioned that some of the hypotheses actually could be tested. He recommended that other, broader approaches to phonics instruction should be evaluated, a point we will come back to later. In 2019, Johnston discussed the features of two of the meta-analyses that had been conducted, one by Torgerson, Brooks and Hall in 2006 and the meta-analysis of phonics instruction from the NRP report, presented in Ehri, Nunes, Stahl, & Willows (2001). Johnston pointed out that the number of studies in the Torgerson study was too small for a meta-analysis and that there were errors in the selection of studies included and in the choice of data used in the analysis. As in the Ehri, et al. (2001) analysis, Johnston analyzed the studies beginning in

kindergarten that had taught synthetic phonics. One study was dropped that had not assessed word recognition and a later time point in first grade was added for examination of outcomes in light of the fact that two of the studies had targeted phoneme awareness instruction in kindergarten, only beginning synthetic phonics instruction in grade one. When Johnston evaluated the outcome in first grade after phonics instruction had been provided, a large increase in effect size was obtained (0.49 vs. 0.28 for the earlier comparison), offering positive support for the value of synthetic phonics instruction. Going forward it will be important to conduct meta-analyses of methods of phonics instruction with rigorous attention to the comparability of numerous dimensions of the instructional methods and other relevant features in order to be able to reach valid conclusions. These are not easy criteria given the many ways instructional studies vary.

For the discussion of phonics research in this article, a number of specific issues will be addressed, focusing first on individual studies that shed light on the merits of synthetic versus analytic methods of reading instruction, then on the value of teaching phonics beyond first grade, and lastly on the outcomes of phonics interventions with struggling readers.

Phonics Instruction: Grapheme-Phoneme vs. Onset-Rime; Systematicity

Not long after the release of the NRP report, Johnston and Watson (2004) reported on a study comparing the reading achievement for 5-year-olds just beginning school who each were taught by one of three different early reading programs: a synthetic phonics program with a grapheme-phoneme focus (without phoneme awareness), an analytic approach with a word family method plus training in phoneme awareness, or the analytic program by itself.   All groups received instruction for 20 minutes per day for 16 weeks. Within the three groups, students came from a range of socio-economic circumstances, although the synthetic phonics group came from relatively more deprived backgrounds. In spite of that difference, the synthetic phonics group had significantly better reading, spelling and phoneme awareness at the end of the kindergarten intervention (and long-term effects for these students both on word level skills and on comprehension were documented over a seven year period (Johnston, McGeown, & Watson, 2012)). Interestingly, the children in this group were the only ones who could read by analogy and they performed better at reading both irregular words and nonwords. Johnston and Watson concluded that synthetic phonics is more effective, that it has benefits for acquisition of phoneme

awareness, and that introducing phonics in kindergarten is advantageous.[3] The observation that synthetic decoding instruction was beneficial for being able to read by analogy is similar to findings by Aaron, Joshi, Ayatollah, Ellsberry, Henderson, & Lindsey (1999) in which they found that sight word reading is closely linked to decoding skill. Aaron et al (1999) recommended that sight word reading is likely to be successful if decoding skills have been well established first.

Two additional studies that were designed to match instructional materials while varying instructional methods suggest that more explicit, systematic methods of phonics instruction facilitate more advanced code skills. The first, by de Graff, Bosman, Hasselman, and Verhoeven (2009), had a narrow focus of instruction on teaching 10 Dutch grapheme-phoneme correspondences to kindergarten students in two experimental conditions. In both, the instruction occurred in fifteen, 15-minute sessions distributed over 5 weeks. For the nonsystematic program, the sequence was not pre-specified, the order of activities were selected freely from a set of 10 different letter-sound and phonics activities, and the instruction did not gradually increase in difficulty. In the systematic condition, on the other hand, children were given a planned set of phonics-through-spelling and synthetic phonics activities. A third, no-treatment control group was included in which students did not receive instruction on these GPC concepts. Of note, the two training groups made the same progress on letter-sound knowledge and both were better than the control group. Notably, the synthetic phonics group made significantly more progress than the other two groups on phoneme awareness and on more advanced spelling and reading measures.

The second study, by Christiansen and Bowey (2005), likewise compared the outcomes of three programs. One was an orthographic rime (OR) program with word families, the second

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[3] Another study comparing synthetic and analytic methods reported equivalent gains with both methods, but the researchers seem to have used a synthetic method that underutilized direct instruction (Walton, Walton, & Felton, 2001). For example, for the synthetic group, words used one particular day were *hat* and *bed*, avoiding words from the same word family, but instead could have been words that would reinforce redundancies and phonics knowledge (such as *hat/had* or *hat/hit*).
Two earlier studies likewise failed to show effects related to the size of the unit (Haskell, Forman, & Swank, 1992); Levy & Lysynchuk, 1997), yet both were brief (6 and 4 weeks in duration, respectively).

focused on GPCs, and the third was the regular whole language program offered in these schools. The students, attending the second year of elementary school in Australia, were described as being at an advanced beginner phase of reading development. The training programs were implemented for 20 minutes per day for 14 weeks in small groups of six to eight children. The lessons for the OR and GPC conditions followed the same basic format: students practiced the same number of words per session and the same words were used across each of six modules of 10 lessons. A key feature of the study was that the words within each program were presented in different orders and combinations so that the OR group had sets of words with the same rhymes/rimes (e.g., top, mop, hop, and shop), whereas in the corresponding GPC condition, students had lists of words that did not include any rhyming words (e.g., mat, hop, run, and shin). The outcomes of this carefully designed study were that the OR and GPC groups both demonstrated significant superiority to the whole language cohort on interim and posttest assessment of nearly all of the reading and spelling measures, consistent with the results of the NRP meta-analysis. Of particular relevance to the present topic, the students in the two decoding programs did not differ statistically on the easier accuracy measures of reading or spelling the words taught in the program and reading sentences. However, the GPC group had significantly better performance on the more advanced reading measures. Thus on measures of the accuracy and speed of reading transfer words with the same orthographic patterns, the GPC group tested significantly higher both on accuracy and speed than both the OR and non-treatment control groups. This finding is noteworthy concerning the importance of explicit phonics approaches for fostering decoding skills that support abilities to read the vast number of novel words that young readers encounter during reading as they enter the middle elementary grades and beyond (Nagy & Herman, 1987). In addition, the GPC group performed significantly better on the spelling measures and on reading comprehension. Both the DeGraff et al (2009) and the Christiansen and Bowey (2005) studies are clear indicators that studies of different methods of instruction need to have a sufficient range of outcomes to be confident that the effects of the methods have been adequately assessed; lack of differences on early, easier skills seems to be misleading. These studies, and the Johnston and Watson (2004) results discussed above, point to the superiority of systematic, synthetic methods of phonics instruction for attaining more advanced reading and spelling skills.

Another source of information comes from a study examining the errors made by students after first grade who had deficient decoding skills (McCandliss et al., 2003) These investigators studied children from 7 to 10 years of age and documented the pattern of decoding success for each phoneme position within one-syllable nonsense words. The findings parallel the sequence of phoneme awareness described in Part I: students were most accurate on the initial onset, with higher performance on single consonants and on the first consonant in consonant clusters in onsets, followed by the final consonant in the rime, and then by the medial vowel. Likewise, the internal consonants in consonant clusters were the weakest positions for consonants (also see Verhoeven & van Leeuwe, 2020). In keeping with Ehri's (2005) theory of reading development, the students' results reveal that they are engaging in a partially alphabetic decoding phase, perhaps the outcome of inadequate phoneme awareness and decoding instruction in the past given the ages of these participants. In this stage of development, Ehri would recommend engaging in activities to build phoneme awareness and letter-sound concepts, not on awareness of onset-rime patterns, in order to help them progress and achieve full alphabetic decoding skills. Compatible with that framework, McCandless et al (2003) then provided one group of students in this study with a 20-hour Word Building intervention that focused on grapheme-phoneme units in all positions within one-syllable words. The intervention entailed forming chains of words that differed by only one phoneme. The sequence progressed from less to more difficult grapheme-phoneme positions and word forms (e.g., from CVC to CCCVCCC). At follow-up testing, significant improvements in standard scores were obtained for these students on decoding, phoneme awareness, and comprehension measures in contrast to comparable students in a control condition, indicating that with systematic and explicit phoneme-level instruction the previously struggling students made noteworthy progress.

As a final comment for this section, I want to note that analytic and synthetic methods do not have to be an either/or choice, but a question of when and for what purpose. Certainly some children, probably those higher in underlying phonological abilities, can learn to read with the analytic method or with a 'linguistic' method (Kilpatrick, 2020) that also begins with onset-rime instruction. However, the evidence supporting the superiority of synthetic methods, plus the pattern of errors identified by McCandless et al (2003), implicate unnecessary costs for many children of early analytic reading methods. Instead of focusing on word families at an early phase, it can be constructive to do so later to reinforce more advanced spelling patterns and

orthographic mappings (e.g., vowel team patterns) (Carol Tolman, personal communication).

Thus, practicing reading sets of words that share a particular pattern after direct instruction in

that pattern has been provided may help students consolidate their knowledge of the pattern and

build their repertoire of words recognized. That sequence of methods also would conform with

the finding noted earlier that reading by analogy is facilitated by decoding knowledge (Aaron et

al., 1999).[4]

Phonics Instruction: Not Just in Kindergarten and First Grade

As noted, the NRP report cited stronger benefits from systematic, explicit code instruction in

kindergarten and first grade than in later grades. Certainly, school practices commonly allocate

less time for code instruction after the first grade. For example, Forman, Schatschneider, Eakin,

Fletcher, Moats, and Francis (2006) documented that roughly 28% of the 90- to 120-minute

language arts period in first grade concentrated on explicit code instruction and that this dropped

to 14% in second grade (also see Connor, Morrison & Underwood, 2007). This timeline brings

up the important issue of whether the extent of phonics instruction typically provided is

sufficient, not only for those students who are lagging in decoding, spelling and word recognition

skills, but for all students.

The notable value of code instruction beyond first grade for all students is evident in the

results of a study by Connor et al. (2007). This research project followed children through the

first and second grades, monitoring students' reading achievement and assessing classroom

instruction along two dimensions: child managed versus teacher managed and code focused

versus meaning focused. Child-by-instruction effects were obtained: a) Students who had begun

first grade with deficient letter-word reading scores did better by the end of second grade if they

had had teacher-managed, code-focused instruction in *both grades*. b) Students who entered first

grade with stronger letter-word reading skills had better skills at the start of second grade if they

had *not* received teacher-managed code instruction in first grade (Connor, Morrison & Katch,

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[4] A further relevant study (Schwanenflugel, Morris, Kuhn, Strauss, & Sieczko, 2008) examined word decoding strategies for nonwords, reporting that children in Grades 1, 2, and 3 used GPC rather than rime strategies, whereas adults tested preferred rime pronunciations for ambiguous nonwords, although they also used GPCs for decoding. The authors concluded that children learn to read by focusing on small units first (i.e, phonemes), subsequently building skills with larger units, and that skilled readers (adults in this case) have flexible strategies that allow them to focus on GPC or rime units, depending on the demands of the task (though see Deavers, Solity, & Kerfoot, 2002).

2004), but had in the *second grade*. For those students in the former group who had had weak letter-word knowledge when they entered first grade, the results indicated that they would reach grade-level reading skills at the end of the second grade only if they had received teacher-managed, code-focused instruction in both years. The pattern for the better readers at the start of first grade may indicate that the phonics instruction in first grade was not well calibrated to their instructional level; they may already have known the phonics units being taught. However, for these students, receiving phonics instruction in second grade in teacher-managed classes resulted in end of year reading performance that was several years above grade level in contrast to being just at grade level if they had had child-managed, meaning focused instruction in Grade 2. These findings suggest that the inclusion of teacher-managed, code-based instruction is critical for at-risk students and also allows other students with stronger reading skills to be far more likely to reach their potential. Results on the 2019 National Assessment of Educational Progress (NAEP, 2019) in the United States were that only 26% of 4th grade students scored at grade level (i.e., proficient) and another 9% reached the advanced level, with the remaining 65% of students lagging in reading achievement to varying degrees. The poor performance on reading achievement seems likely to be linked, at least in part, to problems with the method and content of reading instruction commonly provided, with the studies discussed here pointing to the importance of direct instruction beyond first grade as a contributing factor at all levels of reading aptitude. (See Figure 1 for a framework of early reading instruction that outlines phonics instruction beyond first grade.)

   Moving forward, research on the value of advanced phonics instruction in the regular classroom needs to be expanded. Further studies are needed on student outcomes in reading spelling and writing when instruction in second grade and in later grades augments knowledge of how the orthographic system works through increased understanding of spelling patterns, spelling origins, morphemes, and features of multisyllabic words (e.g., Bowers & Bowers, 2017; Ganske, 2000; Gaskins, 2000; Henry, 2010). Not presenting this material seems somewhat akin to the hypothetical case of teaching addition and subtraction concepts in math in first grade and not building computational or conceptual skills beyond that.

Phonics Instruction for Struggling Readers

Weaknesses in phonics, in decoding, spelling, and word recognition, and also manifested in poor fluency, are very common among students with low levels of reading achievement. At the same time, it is essential to appreciate that the instructional needs of struggling readers should be calibrated according to the particular areas of deficiency for individual students within the phonics domain and across other areas. Leach, Scarborough and Rescorla (2003) documented that a sample of fourth-grade students with reading difficulties fell into three groups: those with word level reading problems (35%), those with weak comprehension and good word skills (32%), and those with both sources of reading deficits (32%). This finding, and the evidence of varying sources of reading challenges (e.g., Catts & Adloff, 2011), clearly identifies the necessity of providing the appropriate kinds of intervention(s) for students. A further point that should be recognized is that within word-level reading development, students who are having difficulties of course will vary in the extent of their progress. For example, some students beyond first grade who have weak phonics skills may know many of the single consonant grapheme/sound patterns, but little about vowel patterns, signaling a low starting point for intervention, whereas other students may have mastered the short vowels in closed syllable patterns, but need to systematically learn the other vowel patterns. Giving students the same intervention program who in fact differ in terms of what needs to be addressed would be a disservice, not making optimum use of intervention. Although not the focus of this article, the presence of comprehension-related weaknesses other than at the word level also should be recognized and treated, again differentiating according to the profiles of students' oral language and comprehension performance. Adjusting intervention according to need is not a new concept and is at the center of Response–to-Intervention protocols (for discussion, see Connor, Piasta, Fishman, Glasney, Schatschneider, Crowe, … & Morrison (2009)). Connor et al (2009) reported stronger literacy gains for first-grade students when their intervention teachers more precisely delivered amounts of instruction recommended by software programmed to compute how much and which topics of instruction are required based on two subtests of the Woodcock Johnson Tests of Achievement (Mather & Woodcock, 2001) (i.e., the Letter-Word identification test and the Passage Comprehension test). This result helps verify the value of differentiation and provides promise of ways to facilitate teachers' decision making about the instructional needs of pupils making normal progress and of those experiencing difficulties (https://www.learningovations.com/research).

The research evidence on the value of systematic, explicit phonics instruction for students who are not making good progress in this domain is consistent across a wide age range. In kindergarten and first grade, multiple studies have reported improvements in reading skills by children at risk (e.g., Hatcher, Hulme, & Snowling, 2004; Vadasy & Sanders, 2008), as did a meta-analysis of studies with urban minority students (Jeynes, 2007). After first grade, studies have documented the merit of word building activities that systematically foster mastery of orthographic skills (e.g., Blachman, Schatschneider, Fletcher, Clonan, Shaywitz, & Shaywitz, 2004; McCandless et al., 2003). Variations in methods have been found to be effective as long as they nonetheless adequately target grapheme-phoneme knowledge (e.g., Torgesen, Alexander, Wagner, Rashotte, Voeller, & Conway, 2001). Advancing to older grades, two meta-analyses reported moderate effect size gains for students in grades 6-12 (Edmonds,Vaughn ,Wexler, Reutebuch, Cable, Tackett, et al., 2009; Scammaca, Roberts, Vaughn, Edmonds, & Wexler, 2007). Positive outcomes for middle-school students are illustrated by studies that have used a number of approaches for building phonics skills, such as peer mediation (Calhoon, 2005), analysis of graphosyllabic patterns in words (Bhattacharys & Ehri, 2004), and Response-to-Intervention methods (Pyle & Vaughn, 2012).

One observation of note is the value of providing depth in instruction of complex grapheme-phoneme correspondences for students at risk (Savage, Georgiou, Parrila, Maiorino, Dunn & Burgos, 2020**)** and also of going beyond grapheme-phoneme correspondences. For example, Lovett, Lacerenza, Borden, Frijters, Steinbach, and DePalma (2000) showed benefits from teaching GPC patterns and in addition giving high school students strategies such as alerting them to variable vowel pronunciations (e.g., the two pronunciations of 'ea' in *speak* and in *head*) and teaching them to peel off prefixes and suffixes (also see Morris, Lovett, Wolf, Sevcik, Steinbach, Frijters, & Shapiro (2012) and Steacy, Elleman, Lovett, & Compton (2016)).

A further point is that intensive intervention appears to be necessary for students who have significant reading difficulties (e.g., Miciak, Roberts, Taylor, Solis, Ahmed, Vaughn & Fletcher, 2017; Vaughn, Denton, & Fletcher, 2010; Vaughn, Wexler, Leroux, Roberts, Denton, Barth, & Fletcher, 2012). An encouraging finding is that long-term beneficial effects on word identification from an intensive form of reading remediation in grades 2 or 3 were found to be evident many years later (Blachman, Schatschneider, Fletcher, Murray, Munger & Vaughn,

2014). This outcome may have occurred, in part, because of the early grade level of the students when the intervention was provided (Lovett, Frijters, Wolf, Steinbach, Sevcik, & Morris, 2017).

Summary Remarks: **Phonics**

1. Phonics instruction is most effective with a synthetic method. The implications of research on phonics are ever more compelling. The studies that have been done with careful comparisons of analytic versus synthetic methods have shown strong advantages of synthetic approaches. Teaching code skills in this way leads to development both of basic and more advanced phonics concepts, also facilitating reading by analogy (e.g., Christiansen & Bowey, 2005) and sight word recognition (Aaron et al., 1999). A factor in the earlier finding of the NRP study of comparable results for the two methods may have been based on assessment of low level reading skills, as well as from analysis with some studies at a time point before synthetic phonics instruction had begun. Likewise, systematic, explicit instruction of GPCs with thorough instruction on each position in one-syllable words, following a developmental progression of code skills (i.e., internal consonants in consonant clusters after other positions are mastered), benefits decoding skills, as well as phoneme awareness and reading comprehension (e.g., McCandless et al., 2003). In addition, beginning synthetic code instruction in kindergarten is effective (Johnston & Watson, 2004), providing a more productive coordination of phoneme awareness and code skills at this grade level than would onset-rime instruction.

2. Phonics instruction should continue beyond kindergarten and first grade. The striking results of Connor et al (2007) documented the importance of teacher-managed, code-focused instruction in the second grade (both for students who entered first grade with negligible reading skills and those who began with stronger skills), helping all succeed at reading and better reach their potential. These results indicate that teaching code related concepts needs to continue beyond GPC instruction in first grade.

3. When struggling readers have weaknesses in phonics, explicit phonics remediation should be provided, tailored to students' levels of skill development. The evidence of successful interventions for older struggling readers with programs that teach graphosyllabic patterns (Bhattacharya & Ehri, 2004), complex GPC patterns (Savage et al., 2019), and other code and morphological concepts (e.g., Lovett et al., 2000) likewise indicate the need to extend the scope of remedial instruction for students with phonics weaknesses. The teaching concepts that have

been found to be beneficial with poor readers suggest content that in all likelihood would enrich code instruction in the regular classroom as well.

CLOSING REMARKS

The research reviewed here underscores the importance of the kindergarten year for teaching phoneme awareness and letter knowledge, and for segueing into beginning reading with phonics instruction that is systematic, explicit and synthetic. Subsequent word-level instruction needs to extend beyond first grade, covering more advanced content about the structure of the writing system. For students needing further support in word reading skills, phonics interventions should be provided at the level required.

In closing, I want to add that evidence clearly indicates the benefits for students of being consistently engaged with reading and writing activities in addition to being provided with explicit and systematic instruction in phoneme awareness and phonics instruction. For example, Xue and Meisels (2004) published results from a large sample of kindergarten children (n=13,609), reporting that "integrated language arts works better in classrooms where phonics is also taught more frequently (p. 219)" and vice versa. This observation concurs with conclusions reached long ago by Chall (1967) and by Adams (1990), and again stated in the NRP report, that teaching phonics is not in opposition to providing ongoing reading and writing activities with a focus on comprehension and communication. In short, it is well past time for the reading wars to be over and for widespread recognition that both components are essential for literacy success (Castles, Rastle, & Nation, 2018). In turn, it is of the utmost importance to give current and future teachers the knowledge and skills required to provide this breadth of instruction.

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Figure 1

An Outline for Phonological Awareness and Phonics Instruction in Pre-K Through Grade 2 (by Kari Kurto & Susan Brady)

	Pre-K	Kindergarten	Grades 1 and 2
Phonological Awareness Skill	**Phonological Sensitivity**	**Early Phoneme Awareness**	**Advanced Phoneme Awareness**
	Awareness of larger speech sounds in spoken words: rhymes, onsets, syllables	Awareness of individual phonemes in spoken words using words with simple syllable patterns: CV, VC, CVC Initial → Final → Medial	Awareness of individual phonemes in spoken words using words with complex syllables that have consonant blends: CCVC, CVCC, CCVCC
		⇕ **Alphabetic Principle** Insight/understanding that printed letters represent phonemes in spoken words	
Letter-Sound / Phonics Skill	**Pre-Phonics**	**Beginning Phonics**	**Building Phonics, Spelling, & Word Recognition**
	Students begin to learn letter names and some letter sounds.	Students learn and practice grapheme-phoneme correspondences for single letter graphemes and three digraphs: *sh, ch, th.*	Students learn and practice remaining phoneme-grapheme correspondences for all speech sounds in English.
		Syllable type instruction to provide students with strategies to recognize vowel patterns by noticing what letters follow the vowel (See Moats, 2020).	
		Morphemes are introduced (e.g., *-s, -ed, -ing*).	Advanced Phonics: Syllable division strategies, additional common spelling patterns, and and morpheme knowledge. Beyond Grade 2, continue advanced phonics (e.g., final stable syllables, rule breakers, spelling rules, morphemes).

Figure 2. The Development of Phoneme Awareness

The Development of Phoneme Awareness

A. Awareness of External Phonemes
 	
   1. **Initial consonants** in spoken words (examples: /b/ in *bed*; /d/ in *dancer*).
 	
   2. **Final consonants** in spoken one-syllable words (examples: /s/ in *bus*; /ch/ in *teach*).

B. Awareness of Internal Phonemes
 	
  3. Phoneme awareness of **medial phonemes** in spoken CVC words (examples: /a/ in *sat*; /u/ in *duck*).
 	
  4. **Internal consonants in consonant clusters** (blends) in spoken one-syllable words (examples: /t/ in *stop* (CC̲VC), /m/ in *pump* (CVC̲C, /r/ and /s/) in *brisk* (CC̲VC̲C)).*

*Students who can segment and identify the internal consonants in words with CCVCC structures generally also do well with words with three consonants in a cluster (e.g., st̲rike, sc̲rape) but, if need be, could practice with words of that type as well.