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ABSTRACT

Instruction for beginning readers is thought to be needed on several fronts, including phonemic awareness, phonics, fluency, reading comprehension, and vocabulary. The National Reading Panel reviewed the findings of many experiments to determine whether there was sufficient scientific evidence to indicate the effectiveness of these forms of instruction in helping students learn to read. This paper reviews one part of their report, that involving the evidence of systematic phonics instruction. The paper states that because the writing system in English is more complex and variable than in some languages, it is harder to learn, making systematic phonics instruction even more important to teach, because children will have difficulty figuring out the system on their own. It points out that a primary goal of phonics instruction is to teach students to read words in or out of text. It explains that phonics is a method of instruction that teaches students correspondence between graphemes in written language and phonemes in spoken language and how to use these correspondences to read and spell words. It notes that phonics instruction is systematic when the major grapheme-phoneme correspondences are taught and they are covered in a clearly defined sequence. According to the paper, the phonics review sought to determine whether there is experimental evidence showing that systematic phonics instruction helps children learn to read more effectively than unsystematic phonics instruction or instruction teaching little or no phonics and whether phonics instruction is more effective under some circumstances than others and for some students more than others. The paper discusses the 38 studies were reviewed in the meta analysis. Appended is a list of the 38 studies. (Contains 2 tables and 41 references.) (NKA)

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By Linnea C. Ehri

Paper presented at the invitation seminar organised by the Standards and Effectiveness Unit, Department for Education and Skills, British Government (London, England, March 17, 2003)

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Systematic Phonics Instruction:
Findings of the National Reading Panel

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Teaching beginners to read is complex. Instruction is thought to be needed on several fronts, including phonemic awareness, phonics, fluency, reading comprehension, and vocabulary. The National Reading Panel reviewed the findings of many experiments to determine whether there was sufficient scientific evidence to indicate the effectiveness of these forms of instruction in helping students learn to read. I will review one part of this report, that involving the evidence for systematic phonics instruction. (For the complete report, see Ehri, Nunes, Stahl, & Willows, D., 2001; National Reading Panel Report, 2000.)

How Alphabetic Knowledge Contributes. Instruction in systematic phonics is thought to be essential for learning to read because the writing system is alphabetic. Beginners cannot become skilled readers if they do not know the system. Letters and combinations of letters in the spellings of words referred to as graphemes represent the smallest units of sound in the pronunciations of words, referred to as phonemes. Systematic phonics instruction teaches beginners the major grapheme-phoneme correspondences and how to use these to decode and spell words. Also it teaches phonemic awareness which is the ability to analyze and manipulate phonemes in speech, for example, how to break the spoken word teach into three phonemes, /t/-/e/-/ch/, or how to blend these phonemes to say the whole word. Because the writing system in English is more complex and variable than in some other languages, it is harder to learn. This makes systematic phonics instruction even more important to teach, because children will have difficulty figuring out the system on their own.

A primary goal of phonics instruction is to teach students to read words in or out of text. Readers have available several ways to read words (Ehri, 1991, 1994). All of these ways require knowledge of the alphabetic system. Unfamiliar words may be read by decoding, that is, by converting letters into sounds and blending them to form recognizable words, for example, pronouncing the three graphemes sh, i, p and blending them to say ship, or pronouncing the onset (initial consonants) and rime (vowel and following consonants) sl, eep, and blending them to say sleep. Another way to read unfamiliar words is by analogy, that is, by applying knowledge of familiar words to read unfamiliar words, for example, applying the known word rock to read the new word smock by blending sm with the shared ending -ock. Another way to read unfamiliar words is by prediction using some of the letters plus

information in the text, for example, in the sentence, "For breakfast, he poured milk on his c.....," the final word is likely to be cereal or cheerios. However, guessing words based on partial letters is less reliable and often less accurate than processing letters fully to identify words. The goal of systematic phonics instruction is to teach students to process all the letters in words to read them.

Whereas unfamiliar words may be read in one of these ways, familiar words are read from memory by sight, which involves looking at the word and immediately recognizing it because it has been read before and stored in memory. People used to think that readers learned to read sight words by memorizing their visual shapes. However, research has led us to reject this idea. Now we know that sight word learning depends upon the application of grapheme-phoneme correspondences. These provide the glue that holds the words in memory for quick reading (Ehri, 1992). Becoming a skilled reader of sight words requires knowledge of phonemic segmentation, letter-sound correspondences, and spelling patterns to bond the complete spellings of specific words to their pronunciations and meanings in memory (Ehri, 1980, 1992, 1998; Perfetti, 1992; Rack, Hulme, Snowling & Wightman, 1994; Reitsma, 1983; Share, 1999). For example, readers learn brush by forming connections between its graphemes b-r-u-sh and corresponding phonemes in the word's pronunciation along with its meaning. A skilled reader is able to read familiar words accurately and quickly because all of the letters have been secured in memory. In contrast, a weak reader reads words less accurately and more slowly and may even misread similarly spelled words such as short, shirt and sheet because only some of the letters are connected to phonemes in memory. Words remain poorly connected when readers habitually guess words from partial letters and contextual cues without analyzing how all the letters in spellings match up to phonemes in pronunciations (Ehri & Saltmarsh, 1995; Stanovich, 1980).

Phonics instruction is thought to help students not only recognize words but also comprehend text. Readers must be able to read most of the words in a text to understand its meaning. Although necessary, being able to read all the words may not be sufficient because comprehending a text requires other capabilities as well such as knowing the meanings of the words, possessing relevant world knowledge, and being able to remember the text already read. Thus, word reading skill is one of several factors influencing comprehension.

Phonics instruction enables students to write words. Unfamiliar words may be written by creating spellings that represent sounds in the words. Familiar words are written by

retrieving correct spellings from memory. As students acquire phonemic segmentation skill, knowledge of grapheme-phoneme correspondences, and familiarity with common spelling patterns, and as they practice reading and writing words, they become better able to remember correct spellings (Griffith, 1991).

In sum, phonics instruction is thought to contribute in helping students learn to read because it teaches them phonemic awareness and use of letter-sound relations to read and spell words. Researchers have found that phonemic awareness and letter knowledge are the two best school-entry predictors of how well children will learn to read during the first two years of instruction (Share, Jorm, Matthews & Maclean, 1984). Let us take a closer look at experimental evidence regarding the effectiveness of systematic phonics instruction.

What is Systematic Phonics Instruction? Phonics is a method of instruction that teaches students correspondences between graphemes in written language and phonemes in spoken language and how to use these correspondences to read and spell words. Phonics instruction is systematic when all the major grapheme-phoneme correspondences are taught and they are covered in a clearly defined sequence. This includes short and long vowels as well as vowel and consonant digraphs such as oi, ea, sh, th. Also it may include blends of letter-sounds that form larger subunits in words such as onsets and rimes.

Over the years educators have disagreed about how beginning reading should be taught. Some have advocated starting with a systematic phonics approach while others have argued for a whole word approach or a whole language approach. Disagreement has centered on whether teaching should begin with explicit instruction in letter-sound correspondences, or whether it should begin with memorizing whole words, or whether initial instruction should be meaning-centered with letter-sound correspondences taught incidentally in context as needed.

The purpose of our phonics review was to determine whether there is experimental evidence showing that systematic phonics instruction helps children learn to read more effectively than unsystematic phonics instruction or instruction teaching little or no phonics. Also of interest was whether phonics instruction is more effective under some circumstances than others and for some students more than others.

Several different approaches have been used to teach phonics systematically (Aukerman, 1971, 1984; Harris & Hodges, 1995). These include synthetic phonics, analytic phonics, embedded phonics, analogy phonics, onset-rime phonics, and phonics through spelling. These approaches differ in several respects. Synthetic phonics programs use a part-to-whole approach

that teaches children to convert graphemes into phonemes (e.g., to pronounce each letter in stop, /s/-/t/-/a/-/p/, and then to blend the phonemes into a recognizable word). Analytic phonics uses a whole-to-part approach that avoids having children pronounce sounds in isolation to figure out words. Rather children are taught to analyze letter-sound relations once the word is identified. For example, the teacher might write the letter P followed by several words, put, pig, play, pet. She would help students read the words and recognize that they all begin with the same sound that is associated with P. Phonics-through-spelling programs teach children to segment and write the phonemes in words. Phonics in context teaches children to use letter-sound correspondences along with context cues to identify unfamiliar words they encounter in text. Analogy phonics teaches children to use parts of written words they already know to identify new words. For example, they are taught a set of key words that are posted on the wall (e.g., tent, make, pig) and then are taught to use parts of these words to decode unfamiliar words by pronouncing the shared rime and blending it with the new onset (e.g., rent, bake, jig). Some phonics programs are hybrids that include components of two or more of these approaches.

Phonics programs may differ in several other important ways, for example, how many letter-sound relations are taught and how they are sequenced, whether phonics generalizations are taught, whether phonemic awareness is taught separately and explicitly, the pace of instruction, whether learning activities include oral drill-and-practice or reciting phonics rules or filling out worksheets, whether children read decodable text in which the vocabulary is limited mainly to words containing familiar letter-sound associations, whether phonics instruction is embedded in or segregated from the literacy curriculum, whether the teaching approach involves direct instruction in which the teacher takes an active role and students passively respond, or whether a "constructivist" problem-solving approach is used (Adams, 1990; Aukerman, 1981).

Evaluating the effectiveness of systematic phonics instruction has been addressed many times in the literature. The best known effort was Chall's (1967) comprehensive review of beginning reading instruction covering studies up to the mid-1960's, Learning to Read: The Great Debate. Her basic finding was that early and systematic instruction in phonics led to better achievement in reading than later and less systematic phonics instruction. This conclusion has been reaffirmed in many research reviews conducted since then (e.g., Adams, 1990; Anderson, Hiebert, Wilkinson, & Scott, 1985; Balmuth, 1982; Dykstra, 1968).

At the time of Chall's (1967) original review, the contrast between phonics instruction and the alternative "look-say" methods was considerable. In the look-say approach, children were taught to read words as wholes, and they practiced reading words until they had acquired perhaps 50 to 100 in their sight vocabularies. Only after this, toward the end of first grade, did phonics instruction begin.

More recently, whole language approaches have replaced the whole word method as the most common alternative to systematic phonics programs. The shift has involved a change from very little letter-sound instruction to a modicum of letter-sounds taught unsystematically. Whole language teachers are not told to wait until a certain point before teaching children about letter-sound relationships. Typically they provide some instruction in phonics, usually as part of invented spelling activities or through the use of graphophonemic prompts during reading (Routman, 1996). However, their approach is to teach it unsystematically in context as the need arises. Observations suggest that in whole-language classrooms, instruction in vowel letter-sound correspondences occurs infrequently (Stahl, Duffy-Hester, & Stahl, 1998).

In our meta-analysis, the effectiveness of systematic phonics instruction was compared to various types of non-phonics or unsystematic phonics instruction given to control groups. In some studies, controls received whole language instruction, or whole word instruction, or some type of basal program consisting of structured books and materials. If studies included more than one control group, we selected the control group receiving the least phonics instruction. We refer to control treatments in various ways, as unsystematic or non-systematic phonics or no phonics, all of which should be regarded as synonymous.

A question of particular interest was when should phonics instruction begin? Some countries such as New Zealand and the United Kingdom introduce children to reading and writing at the age of 5 in full-day programs. In the U.S., formal reading instruction typically begins in first grade at the of 6 after a year of emergent literacy instruction in kindergarten. When phonics instruction is introduced above first grade, students have already acquired some reading ability presumably from another method. Exerting an impact on older students may be harder because it may require them to change their way of processing print. Our database included studies that introduced phonics to students from kindergarten to sixth grades. We expected that phonics instruction would prove more effective in kindergarten and first grade than in later grades.

Phonics Meta-Analysis. We searched the literature for experiments comparing the

effectiveness of systematic phonics instruction to instruction providing unsystematic phonics or no phonics instruction. We limited attention to experiments with control groups in order to base our conclusions on the strongest scientific evidence available in the field. The value of experimental evidence is that it allows one to conclude that any differences in reading outcomes were caused by the phonics instruction rather than some other factor.

Other criteria were used to select studies as well. They had to be published after 1970 in refereed journals. Studies had to teach phonics in English and measure reading as an outcome. Studies had to involve interventions that might be found in schools, not short-term laboratory studies teaching very limited alphabetic processes. Studies were not those included in the other NRP meta-analysis examining phonemic awareness instruction (see Ehri, Nunes, Willows, Schuster, Yaghoub-Zadeh & Shanahan, 2001).

A total of 38 studies met our qualifications, and they are listed in the Appendix. From these, 66 treatment-control group comparisons were derived. Different age/grade and reader achievement levels as well as different types of phonics treatments and control groups within a study provided separate comparisons. Studies were coded for several characteristics to see whether effects of phonics instruction were evident under more specific conditions called moderator variables.

Phonics instruction is considered particularly beneficial to children with reading problems because poor readers have exceptional difficulty decoding words (Rack, Snowling, & Olson, 1992). A question of interest was whether phonics instruction helps to prevent reading failure in at risk beginning readers and to remediate reading difficulties in older poor readers. In the analysis, we distinguished normally achieving (NA) readers and three categories of poor readers. At risk (AR) readers were kindergartners and first graders judged to be at risk for future reading difficulties because of poor letter knowledge, poor phonemic awareness, poor reading skills, or enrollment in low achieving schools. Low achieving (LA) readers were older children (above 1st grade) who were reading below grade level. Students with a reading disability (RD) were older children (mostly above 1st grade) who were reading below grade level but were at least average cognitively.

To see whether systematic phonics instruction produced higher scores in reading than non-phonics instruction, we calculated a statistic called effect size. For each study, we determined the mean reading score of the phonics group and subtracted the mean reading score of the control group to see whether the phonics mean was higher. We divided this value by the

standard deviation to put all the values on the same scale so we could analyze effect sizes across studies. The DSTAT statistical package (Johnson, 1989) was used to calculate mean effect sizes weighted by sample size and to test the influence of moderator variables.

Effect size tells you whether the treatment group achieved a higher reading score than the control group. It presents the effect of phonics instruction as a number. If the effect size is zero, this means that there was no effect. The phonics group and the control group read equally well at the end of instruction. If the effect size is a positive number, the phonics group read better than the control group. If the effect sizes is a negative number, the phonics group read worse than the control group. Researchers interpret 0.20 as a small effect, 0.50 as a moderate effect, and 0.80 as a large effect (Cohen, 1988).

Performance on six outcomes was analyzed: decoding regularly spelled real words; decoding pseudowords; reading real words that included irregularly spelled words; comprehending text; reading connected text orally; spelling words correctly or according to developmental criteria (Morris & Perney, 1984; Tangel & Blachman, 1995). Outcomes were measured at various times: at the end of instruction; at the end of the first school year if the program was taught for more than one year; after a delay which ranged from four months to one year to assess long-term effects of instruction. In analyzing effects of moderator variables, we used performance at the end of instruction or at the end of the first year.

Effect sizes across the six outcome measures were averaged to create one overall effect size indicating the impact of phonics instruction on learning to read. Spelling was included because it is known to be highly correlated with reading. Spelling measures contributed 16% of the effect sizes while reading contributed 84%. (For a more complete reporting of findings, see Ehri et al, 2001).

The entire pool of effect sizes is presented in Table 1. Inspection of these values reveals that most were positive, indicating that in most of the studies, the group receiving phonics instruction read better than the control group.

Table 2 reports the mean effect sizes for various subsets of studies. It is apparent that effects of systematic phonics instruction on reading were statistically greater than zero and moderate in size, regardless of whether effects were measured at the end of the program or at the end of the first year. The overall mean effect size was +0.41. These findings indicate that systematic phonics helps children learn to read more effectively than programs with little or no phonics instruction.

Inspection of the column of effect sizes associated with moderator variables in Table 2 reveals that the vast majority was significantly greater than zero (those marked with an asterisk). This suggests that systematic phonics instruction was effective across a variety of conditions and characteristics.

Phonics instruction facilitated reading acquisition in both younger and older readers. Effect sizes were statistically greater than zero in both cases, but were statistically larger among kindergartners and 1st graders than among 2nd through 6th graders. These findings indicate that phonics instruction exerts its greatest impact early.

In most of the studies, phonics instruction lasted one school year or less. However, in three studies, phonics instruction began in kindergarten or first grade with at risk readers and continued for two or three years (Blachman, Tangel, Ball, Black & McGraw, 1999; Brown & Felton, 1990; Torgesen, Wagner, Rashotte, Rose, Lindamood, Conway, & Garvan, 1999). The mean effect size at the end of each grade level across these studies was moderate and the strength was maintained across the grades: kindergarten +0.46; 1st grade +0.54; 2nd grade +0.43. This confirms the value of starting phonics early and continuing to teach it for two to three years.

The students who received phonics instruction varied in age/grade and reading ability. Kindergartners and 1st graders, particularly those at risk, typically began phonics instruction as non-readers or novice readers with much to learn whereas children in 2nd through 6th grades had already been exposed to reading instruction and had made at least some progress when phonics instruction was introduced. Most of the comparisons with older students (78%) involved low achieving readers or readers with RD. Table 2 shows mean effect sizes grouped by grade and reading ability. Effects were statistically significant for all but one group. They were moderate to large for at-risk and normally achieving readers in kindergarten and 1st grades. Effect sizes were significant but smaller for 2nd-6th grade normally achieving readers and students with RD. These findings indicate that phonics instruction improves reading ability more than non-phonics instruction not only among beginning readers but also among normally progressing readers above first grade and older readers with RD. In contrast, phonics instruction did not enhance reading among low achieving readers.

The aim of phonics instruction is to help children acquire alphabetic knowledge and use it to read and spell words. Table 2 displays effect sizes for the six different literacy outcomes. Results are reported separately for younger and older students. Among beginners, phonics

instruction produced significant effects on all six measures, with effects ranging from moderate to large on five measures.

Among older readers, a different picture emerged. Effects on decoding were moderate, and effects on reading miscellaneous words were small to moderate. However, effects on spelling and reading comprehension were not statistically greater than zero. These findings reveal stronger effects on measures of decoding regularly spelled words and pseudowords than on the other four measures, not surprisingly since phonics instruction focuses on teaching students to decode unfamiliar words. The absense of significant effects among older students on spelling and reading comprehension may result from a greater need in the higher grades for specific instruction targeting comprehension strategies and background knowledge and for spelling instruction focused on learning individual words.

Studies reporting the socio-economic status (SES) of participants were examined. Results showed that effects favoring phonics instruction were greater than zero and moderate in size for children of low SES as well as middle SES (see Table 2), indicating that phonics instruction helps both low and middle SES children learn to read.

Studies differed in the size of groups receiving instruction, either individuals who were tutored, or small groups, or classrooms. Results revealed that phonics instruction was effective for all three group types, and effect sizes did not differ statistically among the types (see Table 2). These findings suggest that classroom instruction is no less effective than tutoring, a possibility that is important given the expense and impracticality of delivering instruction individually. Of course, if the studies that utilized tutoring were limited to students with hard core reading problems, this might explain why the effect size was not larger.

Effects were examined for three types of systematic phonics programs. One category (39 comparisons) was synthetic phonics, which involved teaching students to sound out letters and blend the sounds into recognizable words. Another category (11 comparisons) involved teaching children to analyze and blend larger subunits of words such as onsets, rimes, phonograms, and spelling patterns. The miscellaneous category (10 comparisons) included a spelling program, traditional phonics basal programs, and some researcher-devised instruction that focused on word analysis procedures. As evident in Table 2, effect sizes in all three categories were statistically greater than zero and did not differ from each other, indicating that all types were more effective than non-systematic or no phonics programs. These findings indicate that as long as phonics programs are systematic, a variety of approaches is effective.

The type of instruction administered to control groups varied. In some cases, students received unsystematic or incidental phonics while in other cases students received no phonics. Control groups were categorized as one of five types based on labels or descriptions provided by authors: basal, regular curriculum, whole language, whole word, miscellaneous. Basal programs were those already in use at schools. "Regular curriculum" covered cases where controls received the regular class curriculum in use at the school with no further specification of its contents except that it did not teach phonics systematically. Programs classified as whole language were based on authors' characterizations. These included Big Books (Holdaway, 1979) and language experience programs. Whole language programs were taught to control groups primarily in first grade (67% of the comparisons). Whole word programs emphasized teaching a sight vocabulary by having students memorize whole words before incidental phonics instruction began. The miscellaneous category was applied to control groups whose instruction did not fit the other categories. This included programs teaching traditional spelling, academic study skills, and tutoring in academic subjects.

The positive effect sizes reported in Table 2 indicate the extent that phonics-instructed groups outperformed each type of control group. Results revealed that effect sizes were statistically greater for groups receiving systematic phonics instruction than for all types of control groups. None of the effect sizes differed statistically among the types of controls. These findings show that systematic phonics instruction produced superior performance in reading compared to all types of unsystematic or no phonics instruction.

Studies in the database varied in methodological rigor. Some studies randomly assigned students to treatment and control groups whereas other studies administered treatments to groups that already existed. Some studies sampled a large number of students whereas others worked with fewer students. From Table 2, it is apparent that more rigorous designs involving random assignment and larger samples yielded effect sizes that were as large as if not larger than effect sizes for other less rigorous designs. These findings confirm that the positive effects of phonics instruction on reading did not arise primarily from less rigorously designed experiments.

In sum, findings of the meta-analysis support the conclusion that systematic phonics instruction helps children learn to read more effectively than non-systematic or no phonics instruction. The impact of phonics instruction on reading was significantly greater in the early grades (kindergarten and 1st grades) when phonics was the method used to start children out

than in the later grades (2nd through 6th grades) after children had made some progress in reading presumably with another method. These results show that early instruction in systematic phonics is especially beneficial for learning to read.

Several possibilities might explain why effect sizes were smaller when phonics instruction was introduced beyond 1st grade. One is that other aspects of reading besides decoding become increasingly important contributors to reading in the later grades. This is suggested in a comparison of effect sizes drawn from the National Reading Panel's (2000) report. Whereas phonics instruction produced an effect size of +0.27 in 2nd through 6th graders, fluency instruction produced an effect size of +0.47, and various forms of comprehension strategy instruction produced effect sizes above +0.80. This suggests that phonics instruction must be coupled with other forms of effective reading instruction in order to achieve maximum impact.

Another explanation is that when phonics instruction is introduced after students have already acquired some reading skill, it may be more difficult to step in and influence how they read, because it requires changing students' habits. For example, to improve their accuracy, students may need to suppress the habit of guessing words based on context and minimal letter cues, to slow down, and to examine spellings of words more fully when they read them. Findings suggest that using phonics instruction to remediate reading problems may be harder than using phonics at the earliest point to prevent reading difficulties.

There is currently much interest in whether systematic phonics instruction is effective for children who are learning English as a second language (ELL). Unfortunately, most of our studies either provided no information about this population or intentionally excluded these students from the sample. Results of only one study pertained to ELL students, that by Stuart (1999) who included 86% ELL in her sample. The effect size she observed was large (+0.73), indicating that phonics instruction helps ELL kindergartners learn to read more effectively than a whole language approach. More research is needed to replicate and extend this finding.

Implications for Teaching Reading. What does systematic phonics instruction look like in classrooms? Although presently we lack a strong research base consisting of experimental studies with control groups showing the importance of the various constituents of systematic phonics instruction, we can nevertheless identify ingredients that are likely to be important, based on theory, available evidence, and professional experience.

Phonics instruction targets several accomplishments for students. They need to acquire

knowledge of the alphabetic system. This includes phonemic awareness, particularly segmentation and blending. This includes learning the shapes and names of all capital and lower case letters. This includes learning the major grapheme-phoneme correspondences. In schools where formal reading instruction begins in 1st grade, kindergarten teachers need to insure that all their students leave kindergarten with solid knowledge of letters and phonemic awareness.

Phonics programs differ in how instruction is sequenced. Some teach children most of the letter-sounds before they learn to read any words, whereas others begin word reading and writing sooner. Once children have some alphabetic knowledge, they need to practice using it to read and write. They need to learn the left-to-right direction. To read new words in or out of text, children need to be taught how to decode the words' spellings. As they practice decoding the same words, connections between letters and sounds are formed for those words in memory and they become able to read those words by sight rather than by decoding. As students practice reading words, they become able to read them automatically. This makes text reading much easier and faster. Of course, learning to read words includes bonding spellings to meanings as well as pronunciations in memory so that word meanings are activated automatically during text reading.

Students learn to apply their alphabetic knowledge to spell words. Novice beginners learn to write the sounds they hear. More advanced beginners work on remembering the correct spellings of words. As students practice reading and writing words, they learn about spelling patterns that recur in words, and knowledge of these regularities enhances their word reading and writing skills.

These are key capabilities to be taught in systematic phonics programs. If you walk into a classroom during a phonics lesson, you should see one or more of these capabilities being taught or practiced.

Phonics programs include several instructional ingredients. One is a plan for teaching all the major letter-sound correspondences. This distinguishes systematic phonics programs from casual, as needed phonics programs which do not follow a plan and hence may not teach some correspondences. Research has indicated that vowels tend to be slighted in these programs.

To help children learn all the letter-sound correspondences, some phonics programs teach mnemonic devices. For example, in the Letterland program (Wendon, 1992), the shape of

K is drawn as the body of a "kicking king" whose first sound /k/ is the sound of the letter. Or the shape of S is drawn as the body of "Sammy Snake." In this way, an easily remembered mediator is taught to help children connect the shape of the letter to its sound. Research shows that this makes it easier for children to learn the correspondences (Ehri, Deffner & Wilce, 1984). In the study by Stuart (1999) using Jolly Phonics, children were taught mnemonics that involved hand or body motions linking letters to sounds.

Synthetic phonics programs teach students to transform graphemes into phonemes and to blend them to form recognizable words. Children begin with two letters and work up to longer sequences. Larger unit programs teach students to read words by breaking them into letter chunks, decoding the chunks, and blending them. In larger unit programs, children might be taught a set of key words whose chunks are useful for reading new words. For example, a key word might be king. The -ing would be used to read fling. Or children might be taught to read ing as a chunk by itself.

It is essential for students to be able to apply their alphabetic and word reading skills to the reading of stories. Systematic phonics programs typically provide special texts for this purpose. The texts are written so that most words are regularly spelled and contain the letter-sound correspondences that children have been taught up to that point. For example, in a text at the easiest level, a large number of words might contain the short a vowel. At a higher level, all the short vowels might appear in different words. At a still higher level, several long as well as short vowels would be present. The easiest decodable texts have very limited language and ideas to comprehend, for example, "The cat sat on a mat," However, as children's word reading skills grow, the texts becomes richer conceptually and more interesting.

These are some ingredients of good phonics instruction. There are also practices that are not so effective. One is the extensive reliance on worksheets to teach phonics. This should not be the primary way that phonics is taught. Teachers need to actively teach students, to explain and model the use of alphabetic principles, and to provide practice with feedback.

Another less effective technique is teaching students to recite complex spelling rules. Being able to state a rule is not equivalent to being able to use the rule. A more effective approach is to have students recognize the pattern by reading and writing words that exhibit the rule.

A third approach that is less effective is to teach phonics as a separate subject unrelated to anything else students are taught during the day. For example, children might study letter-

sound correspondences for 20 minutes every morning, and then move to reading and writing instruction that bears no connection to the phonics lessons. Research shows that students will not apply their alphabetic knowledge if they do not use it to read and write (Juel & Roper/Schneider, 1985). The best phonics program is one that is deliberately integrated with reading and writing instruction.

Systematic phonics programs might exhibit the very best instructional features. However, if they are not carried out by a knowledgeable teacher, their likelihood of success is diminished. Teachers must understand how to implement a phonics program effectively, how to plan lessons and make sure they are carried out. Teachers must hold expectations about the effects of their instruction on students. They must understand what students should know and be able to do better as a result of their teaching. To verify that their instruction is working, teachers need to use informal testing to monitor students' progress toward the expected accomplishments. Teachers need to understand how to enrich instruction for students who don't get it, and how to scaffold lessons to eliminate their problems. The job of teaching reading effectively to classrooms of students requires a high degree of professional competence indeed.

To conclude, we must recognize the place of phonics in a beginning reading program. The goal of making every child a reader is not easy. There is no magic pill to make it happen. Systematic phonics instruction by itself does not help students acquire all the processes they need to become successful readers. Phonics needs to be combined with other forms of instruction to create a comprehensive reading program. Other sections of the National Reading Panel (2000) report indicated the importance of instruction to teach fluency, vocabulary, and reading comprehension strategies. In a meta-analysis of instructional studies employed with students having a learning disability, Swanson (1998, 2000) observed significantly larger effect sizes on reading outcomes when direct skills instruction was combined with comprehension strategy instruction than when each was administered separately to students. By emphasizing all of the processes that contribute to growth in reading, teachers will have the best chance of making every child a reader.

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Table 1
Pool of Mean Effect Sizes of Systematic Phonics Instruction on the Overall Reading Outcome

Levels of Effect Sizes	Observed Effect Sizes: End of Instruction (1 yr)[a]	End of Instruction (>1 year)[b]	Follow-up[c]
3.7	3.71		
2.2	2.27		
2.1			
2.0			
1.9	1.99		
1.8			
1.7			
1.6			
1.5			
1.4	1.41, 1.42		
1.3			
1.2			
1.1	1.19		
1.0			
.9	.91		
.8	.84		.86
.7	.70, .72, .73, .76	.75	
.6	.60, .60, .61, .62, .63, .63	.64, .67	
.5	.50, .50, .51, .53, .53	.52, .54	.56
.4	.43, .44, .45, .47, .48, .49		
.3	.32, .33, .33, .36, .37, .38, .38, .39	.36	.32, .33, .38
.2	.20, .21, .24, .24, .25, .27	.24, .28	.28
.1	.12, .13, .14, .16, .19	.17	
0	.00, .01, .03, .04, .04, .04, .07, .09	.00	
-0	-.07		
-.1	-.11		
-.2	-.20,-.25		
-.3	-.33		
-.4	-.47		-.47

[a] Instruction lasted one year or less.
[b] Instruction lasted between 2 and 4 years.
[c] Followup tests were administered from 4 months to 1 year after instruction ended.

Table 2: Mean Effect Sizes Produced by Systematic Phonics Instruction

Moderator Variables and Levels	No. Cases	Mean Effect Size
Time of Posttest		
End of Training	65	0.41*
End of Training or First Year	62	0.44*
Followup	6	0.27*
Characteristics of Participants		
Grade Levels		
Kindergarten & 1st	30	0.55*
2nd-6th	32	0.27*
Grade and Reading Ability		
Kindergarten At Risk	6	0.58*
1st Normal Achieving	14	0.48*
1st At Risk	9	0.74*
2nd-6th Normal Achieving	7	0.27*
2nd-6th Low Achieving	8	0.15 ns
2nd-6th Reading Disabled	17	0.32*
Outcome Measures		
Kindergarten and First Graders		
Decoding regular words	8	0.98*
Decoding pseudowords	14	0.67*
Reading miscellaneous words	23	0.45*
Spelling words	13	0.67*
Reading text orally	6	0.23*
Comprehending text	11	0.51*
2nd-6th		
Decoding regular words	17	0.49*
Decoding pseudowords	13	0.52*
Reading miscellaneous words	23	0.33*
Spelling words	13	0.09 ns
Reading text orally	6	0.24*
Comprehending text	11	0.12 ns
Socio-economic Status		
Low SES	6	0.66*
Middle SES	10	0.44*
Instructional Delivery Unit		
Individual[a]	8	0.57*
Small Group	27	0.43*
Class	27	0.39*
Characteristics of Instruction		
Type of Phonics Program		
Synthetic	39	0.45*
Larger Phonic Units[a]	11	0.34*
Miscellaneous	10	0.27*

Table 2 (Continued)

Moderator Variables and Levels	No. Cases	Mean Effect Size
Type of Control Group		
Basal	10	0.46*
Regular Curriculum	16	0.41*
Whole Language	12	0.31*
Whole Word	10	0.51*
Miscellaneous	14	0.46*
Characteristics of the Design of Studies		
Assignment to Groups		
Random Assignment	23	0.45*
Use of Existing Groups	39	0.43*
Sample Size		
20 to 31	14	0.48*
32 to 52	16	0.31*
53 to 79	16	0.36*
80 to 320	16	0.49*

Note. * indicates that an effect size was significantly greater than zero at $p < .05$. n.s. indicates it was not significantly different from zero.
[a] This effect size was adjusted to reduce the impact of one atypically large outlier, +3.71, emerging from the study by Tunmer and Hoover (1993). The adjustment involved substituting the next largest effect size in the set.

Appendix: Studies in the Systematic Phonics Instruction Database

Blachman, B., Tangel, D., Ball, E., Black, R. & McGraw, D. (1999). Developing phonological awareness and word recognition skills: A two-year intervention with low-income, inner-city children. Reading and Writing: An Interdisciplinary Journal, 11, 239-273.

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