The Voice
of Evidence
in Reading
Research

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Chapter 8
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Troia (1999) published a critique of PA instruction studies in which he rated the methodological rigor of 28 of the 52 studies in our database. We adopted Troia's rigor rankings and grouped the studies into high, middle, and low rankings. We found that effect sizes for the most rigorous studies were statistically larger than effect sizes for the less rigorous studies (see Table 8.2). These findings again confirm that the best-designed experiments yielded the strongest effects.

In sum, findings of the meta-analysis were positive. The benefits of PA instruction were replicated multiple times across experiments and thus provide solid support for the claim that PA instruction is more effective than alternative forms of instruction or no instruction in teaching PA and in helping students learn to read and spell. Effects of PA instruction were greater under some circumstances than under others. These findings support the value of teaching PA to students.

META-ANALYSIS OF SYSTEMATIC PHONICS INSTRUCTION

What Is Systematic Phonics Instruction?

Phonics is a method of instruction that teaches students correspondences between letters 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 of the major letter–sound correspondences are taught and are covered in a clearly defined sequence. This includes short and long vowels and vowel and consonant digraphs consisting of two letters representing one phoneme, such as *oi*, *ea*, *sh*, and *th*. Also, phonics instruction may include blends of letter sounds that represent larger subunits in words such as consonant pairs (e.g., *st*, *bl*), 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, whereas 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; 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, phonics through spelling, embedded phonics, and analogy phonics. 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,* and *pet.* He or she would help students to read the words and to 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. Embedded phonics 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, children are taught a set of key words that are posted on the wall (e.g., *tent, make, pig*) and then are taught to use these words to decode unfamiliar words by pronouncing the shared rime and blending it with the new onset (e.g., *rent, bake, jig*). Some systematic 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 PA is taught; what pace of instruction is used; whether learning activities include oral drill and practice, 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).

Phonics versus Other Methods Evaluating the effectiveness of systematic phonics instruction has been addressed many times in the literature. The best known effort was Jeanne Chall's (1967) comprehensive review of beginning reading instruction covering studies up to the mid-1960s: *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 50–100 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–sound correspondences 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). Their approach, however, is to teach it unsystematically in context as the need arises. Observations suggest that in whole language classrooms, instruction in consonant letter–sound correspondences may be taught but that 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 with various types of nonphonics or unsystematic phonics instruction given to control groups. In some studies, controls received whole language instruction, 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

This chapter and our meta-analysis refer to control treatments in various ways, as unsystematic phonics, nonphonics, or no phonics.

A question of particular interest to the NRP was when phonics instruction should 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 United States, formal reading instruction typically begins in first grade. When phonics instruction is introduced after first grade, students have already acquired some reading ability presumably from another method. To exert 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 through sixth grades. We expected that phonics instruction would prove more effective in kindergarten and first grades than in later grades.

Phonics Meta-Analysis

Our method for the phonics meta-analysis was very similar to that used in the PA review. We searched the literature for experiments comparing the effectiveness of systematic phonics instruction with instruction providing unsystematic phonics or no phonics instruction. Studies 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; they could not be short-term laboratory studies teaching very limited alphabetic processes. In contrast to the PA review, studies were restricted to those teaching phonics in English. Studies that were included in the PA meta-analysis were not included here even if they might have qualified according to our other criteria.

From the 38 studies that met our qualifications, 66 treatment–control group comparisons were derived. Different age or grade levels and different types of phonics treatment and control groups within a study provided separate comparisons. Studies were coded for several characteristics to permit the analysis of moderator variables.

Characteristics Analyzed 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 typically achieving readers and three categories of poor readers. At-risk readers were kindergartners and first graders judged to be at risk for future reading difficulties because of poor letter knowledge, poor PA, poor reading skills, or enrollment in low-achieving schools. Low-achieving readers were children above first grade who were below average in their reading. Students with a reading disability were children who were above first grade in most cases and who were below grade level in reading but at least average cognitively.

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, and 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, and after a delay that ranged from 4 months to 1 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 The DSTAT program (Johnson, 1989) was used to calculate effect sizes and test whether they were statistically greater than zero. Effect sizes across the six outcome measures were averaged to create one overall effect size indicating the general impact of phonics instruction on learning to read. Spelling was included because it is known to be highly correlated with reading (Ehri, 1997). Spelling measures contributed 16% of the effect sizes, whereas reading contributed 84%. (For a more complete reporting of findings, see Ehri, Nunes, Stahl, et al., 2001.)

Findings The entire pool of effect sizes is presented in Table 8.3. 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 8.4 reports 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 mean effect size at the end of training was +0.41, which is slightly lower than the mean effect size of PA instruction, +0.53. These findings indicate that systematic phonics

Table 8.3.   Pool of mean effect sizes of systematic phonics instruction on overall reading outcome examined in the National Reading Panel Report (NICHD, 2000)

Levels of effect sizes	Observed effect sizes		
	End of instruction (1 year)[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			
0.9	0.91		
0.8	0.84		
0.7	0.70, 0.72, 0.73, 0.76	0.75	0.86
0.6	0.60, 0.60, 0.61, 0.62, 0.63, 0.63	0.64, 0.67	
0.5	0.50, 0.50, 0.51, 0.53, 0.53	0.52, 0.54	0.56
0.4	0.43, 0.44, 0.45, 0.47, 0.48, 0.49		
0.3	0.32, 0.33, 0.33, 0.36, 0.37, 0.38, 0.38, 0.39	0.36	0.32, 0.33, 0.38
0.2	0.20, 0.21, 0.24, 0.24, 0.25, 0.27	0.24, 0.28	0.28
0.1	0.12, 0.13, 0.14, 0.16, 0.19	0.17	
+0	0.00, 0.01, 0.03, 0.04, 0.04, 0.04, 0.07, 0.09	0.00	
-0	-0.07		
-0.1	-0.11		
-0.2	-0.20, -0.25		
-0.3	-0.33		
-0.4	-0. 47		-0.47

[a] Instruction lasted 1 year or less (n = 62).
[b] Instruction lasted between 2 and 4 years (n = 10).
[c] Follow-up tests were administered from 4 months to 1 year after instruction ended (n = 7).

Table 8.4. Mean effect sizes produced by systematic phonics instruction

Moderator variables and levels	Number of cases	Mean effect size
Characteristics of reading outcomes		
Time of posttest		
End of training	65	0.41*
End of training or first year	62	0.44*
Follow-up	6	0.27*
Characteristics of participants		
Grade levels		
Kindergarten and first grade	30	0.55*
Second through sixth grades	32	0.27*
Grade and reading ability		
Kindergarten at risk	6	0.58*
First grade normally achieving	14	0.48*
First grade at risk	9	0.74*
Second through sixth grade normally achieving	7	0.27*
Second through sixth grade low achieving	8	0.15 ns
Second through sixth grade with reading disability	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*
Second through sixth grade		
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
Socioeconomic status (SES)		
Low SES	6	0.66*
Middle SES	10	0.44*
Characteristics of phonics instruction		
Delivery unit		
Individual child⁾	8	0.57*
Small groups	27	0.43*
Classrooms	27	0.39*

(continued)

Table 8.4. *(continued)*

Moderator variables and levels	Number of cases	Mean effect size
Type of program—all grades[a]		
Synthetic	39	0.45*
Larger phonic units[b]	11	0.34*
Miscellaneous	10	0.27*
Type of program—kindergarten and first grades		
Synthetic	20	0.58*
Larger phonic units[b]	5	0.46*
Miscellaneous	8	0.27*
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 study design		
Assignment to groups		
Random assignment	23	0.45*
Use of existing groups	39	0.43*
Sample size		
20–31	14	0.48*
32–52	16	0.31*
53–79	16	0.36*
80–320	16	0.49*

Source: Ehri, Nunes, Stahl, et al., 2001.
Note: * indicates that effect size was significantly greater than zero at $p < .05$; ns indicates that effect size was not significantly different from zero.
[a]There were 6 comparisons not included, two because a combined method was taught, and four that did not measure reading at the end of instruction but only after a delay.
[b]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.

helps children learn to read more effectively than do programs with little or no phonics instruction. In Table 8.4, as in Table 8.2, an asterisk indicates that the effect size was statistically greater than zero, whereas *ns* means that the effect size was not statistically greater than zero.

Inspection of the column of effect sizes associated with moderator variables in Table 8.4 reveals that the vast majority (those marked with an asterisk) were significantly greater than zero. 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 first graders than among second through sixth graders. These findings indicate that phonics instruction exerts its greatest impact early.

In most of the studies, phonics instruction lasted 1 school year or less. In three studies, however, phonics instruction began in kindergarten or first grade with at-risk readers and continued for 2 or 3 years (Blachman, Tangel, Ball, Black, & McGraw, 1999; Brown & Felton, 1990; Torgesen et al., 1999). Mean effect sizes at the end of each grade level were moderate, and their strength was maintained across the grades: kindergarten $d = +0.46$; first-grade $d = +0.54$; and second-grade $d = +0.43$. This shows the value of starting phonics early and continuing to teach it for 2–3 years.

The students who received phonics instruction varied in age/grade and reading ability. Kindergartners and first graders, particularly those at risk, typically began phonics instruction as nonreaders or as novice readers with much to learn, whereas children in second through sixth grades had already been exposed to reading instruction and had made at least some progress by the time that phonics instruction was introduced. Most of the comparisons with older students (78%) involved low-achieving readers or students with reading disability. Table 8.4 shows mean effect sizes for comparisons grouped by grade and reading ability. Effects were statistically significant for all but one group. They were moderate to large for at-risk and typically achieving readers in kindergarten and first grade. Effect sizes were significant but smaller for second- through sixth-grade typically achieving readers and students with reading disability. These findings indicate that phonics instruction improves reading ability more than nonphonics instruction not only among beginning readers but also among typically progressing readers above first grade and older readers with reading disability. 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 8.4 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. Effects on spelling and reading comprehension, however, 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, which is not surprising because phonics instruction focuses on teaching students to decode unfamiliar words. The absence of significant effects among older students on spelling and reading comprehension may result from the greater need for specific instruction targeting comprehension strategies and background knowledge and for spelling instruction focused on learning individual words.

Studies reporting the SES of participants were examined. Effects favoring phonics instruction were moderate in size for children of low SES and middle SES (see Table 8.4), indicating that phonics instruction helps both low and middle SES children learn to read.

Studies differed in the size of groups receiving instruction: individuals being tutored, small groups, or classrooms. Results revealed that phonics instruction was effective for all three group sizes, and effect sizes did not differ statistically among the sizes (see Table 8.4). These findings contrast with the result of the PA review indicating that PA instruction was more effective with small groups than with the other group sizes. The phonics findings suggest that classroom instruction may be 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 serious 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 phonic units of words such as onsets, rimes, and spelling patterns along with phonemes. 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 8.4, effect sizes in all three categories were statistically greater than zero and did not differ statistically from each other, indicating that all types were more effective than nonsystematic or no phonics programs. These findings indicate that as long as phonics programs are systematic, a variety of approaches are effective.

Because phonics instruction exerted its greatest impact on beginning readers, we compared effect sizes for the three types of programs

in kindergarten and first grade. All three types produced effects statistically greater than zero (see Table 8.4). However, effects were much bigger for synthetic and larger phonic unit programs than for miscellaneous programs. Statistical tests revealed that synthetic programs yielded a significantly greater effect size than miscellaneous programs ($p < .05$). Whereas three of the eight effect sizes for miscellaneous programs were zero or negative, no synthetic or larger phonic unit program yielded any effect sizes this low. Although larger phonic unit programs showed moderate effects, this category had only five comparisons, and four of these involved tutoring. In contrast, 85%–88% of the synthetic and miscellaneous comparisons were conducted with small groups or with classrooms. These findings indicate that synthetic phonics is especially effective as a method that classroom teachers can use to teach beginners to read. (This analysis was conducted after the NRP findings were published, so it does not appear in the earlier reports, e.g., Ehri, Nunes, Stahl, et al., 2001; NICHD, 2000.)

The type of instruction administered to control groups varied. In some cases, students received unsystematic or incidental phonics, whereas 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. The *regular curriculum* label covered cases in which 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, teaching academic study skills, and providing tutoring in academic subjects.

The positive effect sizes reported in Table 8.4 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 (see Table 8.4). 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 with all types of unsystematic phonics 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 8.4, 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 weakly designed studies.

In sum, findings of the meta-analysis support the conclusion that systematic phonics instruction helps children learn to read more effectively than nonsystematic phonics or no phonics instruction. The impact of phonics instruction on reading was significantly greater in the early grades (kindergarten and first grades), when phonics was the method used to start children out, than in the later grades (second through sixth grades), after children had made some progress in reading, presumably with another method. The method of teaching phonics in the early grades made a difference, with synthetic phonics showing especially strong effects. These results reveal that early instruction in systematic phonics is especially beneficial for helping children learn to read, particularly when a synthetic approach is used.

Several possibilities might explain why effect sizes were smaller when phonics instruction was introduced beyond first 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 NRP's report (NICHD, 2000). Whereas phonics instruction produced an effect size of +0.27 in second through sixth graders, fluency instruction produced an effect size of +0.47, and various forms of comprehension strategy instruction produced effect sizes greater than +0.80. This suggests that phonics instruction beyond first grade 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 doing so requires changing students' habits. For example, to improve 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. 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 of individuals or intentionally excluded these students from the sample. Results of only one study (Stuart, 1999) pertained to ELL students; 86% of Stuart's sample consisted of ELL students. 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 strong systematic phonics instruction look like in classrooms? Although presently we lack a sufficient 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, the available evidence, and conventional wisdom.

Phonics instruction targets several accomplishments for students. Students need to acquire knowledge of the alphabetic system. They need to acquire PA, particularly segmentation and blending. They need to learn the shapes and names of all capital and lowercase letters. They need to learn the major grapheme–phoneme correspondences. In schools where formal reading instruction begins in first grade, kindergarten teachers need to ensure that all of their students leave kindergarten with solid knowledge of letters and PA.

Phonics programs differ in how instruction is sequenced. Some teach children most of the letter–sound correspondences before they learn to read any words, whereas other programs 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 students practice decoding the same words, connections between letters and sounds are formed for those words in memory and students 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 and pronunciations in memory so that word meanings are activated automatically during text reading.

Students learn to apply their alphabetic knowledge to spell words. Novices 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 the 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 of the major letter–sound correspondences. This distinguishes systematic phonics programs from casual, as-needed phonics programs that do not follow a plan and hence may not teach some correspondences. Research has indicated that vowels tend to be slighted in these casual programs.

To help children learn all of 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. 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 phonic unit programs teach students to read words by breaking

them into letter chunks, decoding the chunks, and blending them. In larger phonic 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 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 /æ/ vowel. At a higher level, all of the short vowels might appear in different words. At a still higher level, several long and short vowels would be present. The easiest texts have very limited language and ideas to comprehend, for example, "The cat sat on the mat." As children's word reading skills grow, however, the texts become richer conceptually and more interesting.

These are some ingredients of good phonics instruction. There are also practices that are thought to be less 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 and how to plan lessons and must 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.

The importance of professional development to enhance teachers' effectiveness in teaching reading was underscored by the chair of the NRP, Dr. Donald Langenberg, who is a physicist and was chancellor of the University of Maryland when the NRP was preparing its report. Dr. Langenberg knew little about reading when he began his job, but he strongly believed in the panel's mission to help schools identify the best ways to teach reading based on scientific evidence. During the panel's first meeting, Dr. Langenberg was given a publication by the American Federation of Teachers (1999) titled *Teaching Reading Is Rocket Science: What Expert Teachers of Reading Should Know and Be Able to Do.* He was especially interested in the booklet because his business is rocket science. Two years later when he presented the NRP report (NICHD, 2000) to the U.S. Congress, he mentioned this book in his speech but complained that its title was misleading. As a physicist chairing this panel for 2 years, he had come to realize that teaching reading is really much *harder* than rocket science (*Hearing on the Importance of Literacy,* 2000).

To conclude, educators and policy makers 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 of 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 NRP report (NICHD, 2000) 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 (1999, 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 have the best chance of making every child a reader.

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