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The Importance of Early Vocabulary for Literacy Achievement in High-Poverty Schools

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Although research documents a key contribution of print skills to early literacy, vocabulary and other language skills also provide an important foundation. Focusing on a sample of several hundred low-income children in 16 urban schools that were implementing literacy interventions, 1st-grade predictors of literacy development were traced over time. Beginning-of-1st-grade letter–word identification and word attack skills were the strongest predictors of reading comprehension at the end of 1st grade. However, vocabulary was the best predictor of reading comprehension at the end of 2nd and 3rd grades. The predictive power of early print-related and phonemic-awareness skills diminished over time, yet vocabulary scores remained an important predictor. Results support an early emphasis on developing meaning skills to prepare low-income children for success in literacy.

Children whose family incomes are at or below the poverty level are especially likely to struggle with reading, a pattern that emerges early and strengthens in the elementary school years. On recent national assessments, only 43% of low-income fourth graders in large urban districts read at a

basic level or higher (Lutkus, Grigg, & Donahue, 2007). Although national assessments have documented modest, incremental improvements in low-income students' reading achievement over the past decade, the performance of most urban, low-income students remains below expectations (Lee, Grigg, & Donahue, 2007).

The experiences of young low-income children differ from those of middle-class children in several domains that affect literacy development. Poor children are less likely to attend educationally focused preschools both because of greater cost and less availability in their communities (Fuller, Eggers-Piérola, Holloway, & Rambaud, 1996). When low-income children are enrolled in preschool, their caregivers typically have lower levels of education and preschools may have less advantageous teacher–child ratios (Dowsett, Huston, Imes, & Gennetian, 2008), both factors that are associated with less consistent caregiver support for oral language and emergent literacy (Dickinson & Tabors, 2001). Communities where low-income children live characteristically offer less access to print—for example, book stores, libraries, signs—than the communities of middle-class children (Neuman & Celano, 2001). Finally, although parent–child interaction patterns vary considerably within social groups (Britto, Brooks-Gunn, & Griffin, 2006), parents of young low-income children are less likely than middle-class parents to engage in the kinds of focused conversational and book-reading routines that promote school-relevant language and literacy skills (Hoff, 2006).

Both oral language and the emergent literacy skills that develop in the preschool years are important foundations for later literacy (Dickinson & Tabors, 2001; Missall, Reschly, & Betts, 2007; Poe, Burchinal, & Roberts, 2004; Roth, Speece, & Cooper, 2002). There is controversy, however, concerning the relative importance of what Whitehurst and Lonigan (1998, 2001) have called *outside-in* skills—skills related to meaning construction—and *inside-out* skills—skills related to decoding print—as early predictors of literacy development. Schatschneider, Francis, Carlson, Fletcher, and Foorman (2004), for example, have argued that code-related skills, specifically phonological skills and naming speed, are more important predictors of first- and second-grade reading achievement than oral language abilities. However, other researchers (Craig, Connor, & Washington, 2003; Dickinson & Tabors, 2001; Roth et al., 2002) present contrasting evidence that meaning-related skills, particularly early vocabulary and discourse skills, are important predictors of later literacy.

This controversy has implications for the design of early literacy programs, particularly for children at high risk of reading failure. The federally sponsored Early Reading First program, for example, addresses children's knowledge of oral language, print awareness, alphabetic knowledge, and phonological awareness; however, programs adopted with Early Reading

First funds may not target the full range of outside-in, as well as inside-out skills. A survey of kindergarten programs nationwide has identified letter- and word-level skills as the main focus of early literacy teaching (Walston & West, 2004). Recent empirical studies, on the other hand, emphasize that a broad range of early language and literacy skills undergirds later reading success, including oral discourse skills, syntactic abilities, and vocabulary knowledge (deJong & van der Leij, 2002; Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003; Poe et al., 2004; Sénéchal & LeFevre, 2002). There is a need, therefore, for closer examination of the development of components of early literacy over time, especially in at-risk populations, focusing on the wide range of language and literacy skills that support the development of integrated reading performances.

FOUNDATIONS OF LITERACY DEVELOPMENT

Literacy incorporates both word-level understandings about how print represents speech and broader understandings about written and spoken language as systems for communicating meaning (Ravid & Tolchinsky, 2002). As children begin formal literacy instruction, their entry into full literacy is supported by knowledge of letters and letter–sound correspondences, by experience with a range of types of print, and by the vocabulary, syntactic, and discourse abilities involved in understanding text (Morris, Bloodgood, & Perney, 2003; Snow & Dickinson, 1991). These foundational skills and understandings ideally develop in home and preschool contexts that include frequent interaction with print, attention to letter names and sounds, opportunities to engage in extended talk, such as narrative, and exposure to domains of knowledge and the networks of words associated with these domains (Craig et al., 2003; Dickinson & Tabors, 2001; Farver, Xu, & Eppe, 2006; Hoff, 2006). Although there is wide variability in home and school experiences of low-income children, preschool and kindergarten environments may not fully support the development of language and literacy skills (Barone, 2002; Vernon-Feagans, 1996). What is less clear and remains controversial in the design of early literacy programs is the relative importance of different language and print skills in supporting low-income children's literacy development over time.

One tentative conclusion from longitudinal research is that early language skills may be stronger predictors of later, rather than beginning, literacy (Dickinson & McCabe, 2001; Griffin, Hemphill, Camp, & Wolf, 2004). Focusing on a sample of middle-class children, for example, Sénéchal and LeFevre (2002) found that levels of phonological awareness developed in the preschool period were the best predictors of end-of-first-grade reading

achievement; other preschool language abilities, specifically receptive vocabulary and listening comprehension, predicted second-grade reading success. In an examination of the literacy progress of low-income Head Start graduates at risk for reading failure, kindergarten vocabulary skills were associated with improvement in reading from first through fourth grade (Spira, Bracken, & Fischel, 2005). In an earlier longitudinal study of middle-class and working-class children, multiple measures of oral language ability in kindergarten (vocabulary knowledge, narrative ability, memory for sentences) predicted later reading comprehension. Kindergarten language abilities were a stronger predictor of reading comprehension at the end of second and third grade, than of first-grade reading comprehension (Mason, Stewart, Peterman, & Dunning, 1992).

This study explores the contributions of both early meaning-related and code-related skills to low-income children's literacy achievement across Grades 1–3. Focusing on one group of children at risk for reading failure, a large sample of children attending high-poverty urban elementary schools, the language and literacy skills children exhibited at the start of first grade are related to their subsequent achievement in the important area of reading comprehension. Reading comprehension is the focus for the longitudinal analyses because this skill area is particularly vulnerable in low-income populations (Lutkus & Weiner, 2003) and because it plays a critical role in overall school success. The participants in this study attended schools in Boston, a large urban district that had implemented multiple reform models for early literacy instruction. The context, therefore, allows for the examination of possible combined effects of children's skill levels at the beginning of first grade and enriched instructional experiences on subsequent achievement.

METHOD

All the children beginning first grade in 16 Boston elementary schools were invited to participate in the research, and children in 15 of the schools continued to participate through the spring of Grade 3. Study schools had student populations that were predominantly African American and Latino and were classified as high poverty: 80% or more of their students were eligible for free- or reduced-price lunch. More than 95% of parents gave permission for their children to participate each year of the study. Table 1 shows the sample characteristics at the end of first, second, and third grade, as well as the characteristics of the longitudinal group who participated at Grades 1 through 3.

At the time of this study, each school was using one of four nationally disseminated approaches to early literacy instruction: Building Essential

TABLE 1
Sample Sizes and Demographic Characteristics for Participating Students
in Grades 1, 2, and 3

	Grade			
Characteristic	*1*	*2*	*3*	*1 and 3*
Number of students	599	611	407	280
Number of schools	16	16	15	15
Number of classrooms	33	35	36	36
Percentage (%) of students who are:				
Female	49	51	53	52
Male	51	49	47	48
Black	53	53	50	49
Hispanic	26	29	32	31
White/Asian	21	18	19	20
Home language:				
English	86	86	85	86
Spanish	6	7	9	8
Other	7	8	6	6
Free lunch	75	73	73	79
Reduced-price lunch	12	14	13	11
Paid	13	13	14	10
Literacy Model:				
BEL	27	26	26	24
DLF	25	24	23	25
LC	26	26	31	34
SFA	22	24	20	18

Note. BEL = Building Essential Literacy, DLF = Developing Literacy First, LC = Literacy Collaborative, SFA = Success for All.

Literacy (Hill & Jaggar, 2003); Developing Literacy First (DLF), Literacy Collaborative (LC; Williams, Scharer, & Pinnell, 2000) and Success for All (SFA; Datnow & Castellano, 2000). Participating schools were nominated by district leaders as making at least good progress in implementing their chosen literacy model and were in a mature phase of instructional change at the time the study began, in their third to fifth years of using the school-selected reform model. See the Appendix for a brief summary of the key features of the four literacy models.

Relationships among children's language and literacy skills at Grade 1 were assessed for 599 participants from 33 English-medium classrooms. Because of the noncomparability of norming groups for Spanish and English assessments, analyses do not incorporate data that was collected in Spanish from children enrolled in Spanish-medium bilingual classes in the study schools.

Although there were some shifts in student participants over the three years of the study, with some students moving out of the schools and others moving in, a substantial core of students was present during Grades 1 through 3, and the broad demographic characteristics of the students who participated in each year of the study remained consistent. Just under 300 students from over 30 classrooms participated from the fall of first grade through the spring of third grade. One smaller school chose not to participate in the study during third grade, and although this modestly decreased the available pool of student participants, the characteristics of the remaining participants appeared to represent a cross-section of students in high-poverty schools in the district. About 80% of the Grade 1–3 participants were Black or Hispanic, for example, and a very high percentage was eligible for either free or reduced-price lunch. There was no strong evidence of differential attrition of participants over time, although the students who participated for all 3 years showed very slightly higher scores on some of the measures of first grade literacy and were slightly more likely to be free lunch eligible than students who left the sample.

In the early weeks of first grade, children were tested individually using the Peabody Picture Vocabulary Test, third edition (PPVT-III; Dunn & Dunn, 1997), a widely used measure of receptive vocabulary. Norms for the PPVT-III were developed using a large socioeconomically and ethnically diverse sample, making it appropriate for use with a diverse group of urban children. The PPVT-III was also selected for use in this study of young children because the responses required by the assessment, pointing to one of a set of pictures, do not require reading or sophisticated metalinguistic skills, a drawback of some other types of vocabulary assessments. The PPVT samples both common, everyday vocabulary, the kinds of words that are known by most children; and more sophisticated academic vocabulary, for young children, words such as *cooperate* and *reptile*. Standard scores, calculated on a scale where 100 represents the 50th percentile, were obtained for each child on the PPVT-III, along with percentile scores.

The students' raw scores, the number of words correctly identified, were used in analyses of changes in achievement over time. Standard scores, age-normed on a scale where a score of 100 represents the 50th percentile, are presented in descriptive statistics to facilitate interpretation and comparisons with other studies.

Children were also assessed at the beginning of first grade with the Yopp–Singer phonemic awareness test (Yopp, 1995), which asks children to segment one-syllable words into component phonemes. Raw scores represent the number of words presented that were correctly segmented. To measure early letter and word reading skill, children were assessed individually with two subtests of the Woodcock–Johnson Diagnostic Reading Battery

(WDRB; Woodcock, 1997): the word and letter identification test, which presents children with lists of upper- and lowercase letters and sight words to read; and the word attack test, which presents children with a list of nonsense words to decode. Because norming information is available for WDRB subtests, both raw scores (number of items correct) and the corresponding national percentile rank scores were calculated for the word and letter identification and word attack subtests.

Finally, children's oral discourse skills were assessed at the beginning of first grade with a narrative task from the School-Home Early Language and Literacy (SHELL) battery (Snow, Tabors, Nicholson, & Kurland, 1995). The task presents children with a standard series of pictures, bound in a notebook, that relate a simple story. Children were asked to dictate a story to go along with the pictures. Children were asked to narrate from memory, with the notebook closed, to avoid responses that were merely picture descriptions. Credit was given for each narrative element reported from the pictures presented, such as an orientation to the story's setting, introduction of story characters, initiating event, high point, or resolution.

At the end of first grade, the PPVT-III, Yopp–Singer, and WDRB subtests were repeated. Students also participated in a group-administered reading comprehension test, the Gates–MacGinitie, Primary 1 comprehension subtest (GMRT-4; MacGinitie, MacGinitie, Maria, & Dreyer, 2000). The GMRT was selected for use in first grade because children select picture responses to demonstrate their comprehension after reading short passages. Other group-administered comprehension assessments require more sophisticated reading and test-taking skills, and thus may underestimate the achievement of at-risk readers.

At the end of second grade, students were again assessed with the PPVT-III, the WDRB subtests, and the GMRT-4, Primary 2 test of reading comprehension. Finally, at the end of third grade, students were assessed with the GMRT-4, Primary 3 test of reading comprehension. Both extended scale scores, which are useful for examining changes over time, and percentile rank scores, which facilitate comparisons with national norms, were calculated for each administration of the GMRT-4.

RESULTS

Analyses

Relationships between early measures of literacy skills from the beginning of first grade and later measures of reading comprehension were examined, first through simple correlations and then through a series of multi-level regression models which included information at both the student level, such

as home language and school-lunch eligibility, and at the school level, such as the average vocabulary score for each school and the school's chosen literacy reform model. For all analyses involving the literacy models, a nested design with classrooms nested within literacy models was used.

Performance at the Beginning of First Grade

Table 2 presents the mean scores for each literacy measure at each time point during Grades 1 through 3. Early first-grade results showed a mixed profile of language and literacy achievement. Standard scores on vocabulary (PPVT-III) were low, averaging only 87, nearly a standard deviation below

TABLE 2
Descriptive Statistics for Language Measures from Grades 1 through 3

Measure	Grade 1 fall	Grade 1 spring	Grade 2 spring	Grade 3 spring
Vocabulary				
Standard score				
Mean	87.0	89.7	89.8	—
SD	14.4	13.6	14.0	
Percentile rank	19	25	25	
Phonemic awareness				
Raw score				
Mean	7.7	16.9	—	—
SD	8.3	10.4		
Letter and word identification				
Raw score				
Mean	17.5	29.6	36.3	—
SD	5.6	6.5	6.2	
Percentile rank	61	74	76	
Word attack				
Raw score				
Mean	2.5	9.3	14.4	—
SD	3.1	5.7	9.0	
Percentile rank	68	67	63	
Oral discourse				
Raw score				
Mean	2.8	—	—	—
SD	1.7			
Reading comprehension				
Extended scale scores				
Mean	—	357	436	457
SD		42	35	34
Percentile rank		45	40	34

normative achievement levels, placing the average study student at the 19th percentile.

Despite weak vocabulary scores, children in this low-income sample performed, on average, above grade-level expectations on the two subtests of the WDRB. The mean letter and word identification score of 17.5 at the beginning of first grade reflected an ability to identify all of the upper and lower case letters presented and to also read several simple sight words. Children received a mean score of 2.5 on the word attack subtest, on average reading two or three short nonsense words. Performances on both of these subtests were well above national averages, reflecting strong performance for children attending high-poverty urban schools.

Beginning of first grade performance on the Yopp–Singer was less strong, where the mean score of 7.7 indicated an ability to segment two-phoneme words like *go*, but not to segment words with three or more sounds. Sample children required considerable modeling and prompting to segment the target words, reflecting lack of previous experiences, for most children, in phonemic segmentation.

Children's discourse performance was comparatively weak, although there was considerable variability among individual children's performances, from children who told elaborate and sophisticated stories to children who could not narrate a single event in response to a series of pictures. The mean score of 2.8 reflected narrative performances that typically included mention of the story characters and one or two events, but no information about story setting or resolution. Setting information and resolution are typically included in picture-prompted narratives by middle-class first graders (Hemphill et al., 1994; Shapiro & Hudson, 1991); thus these average performances reflect some delays or differences in narrative achievement.

Predictors of Literacy Performance

Table 2 also shows performance levels at the end of first, second, and third grade, indicating broad patterns of performance similar to those seen at the beginning of first grade. Study children continued to perform below age expectations in vocabulary, but achieved above grade level, on average, in word reading and word attack at the end of first and second grade. Phonemic segmentation skills improved during first grade, but remained somewhat below grade-level expectations.

Performance on the Gates–MacGinitie reading comprehension assessments, however, were relatively weak and declined relative to grade-level expectations as children moved from first grade through second and third grades. At the end of first grade, mean GMRT-4 scores for the sample were

Progress in Reading Comprehension:
Mean performance of sample students in high-poverty schools compared to national norms
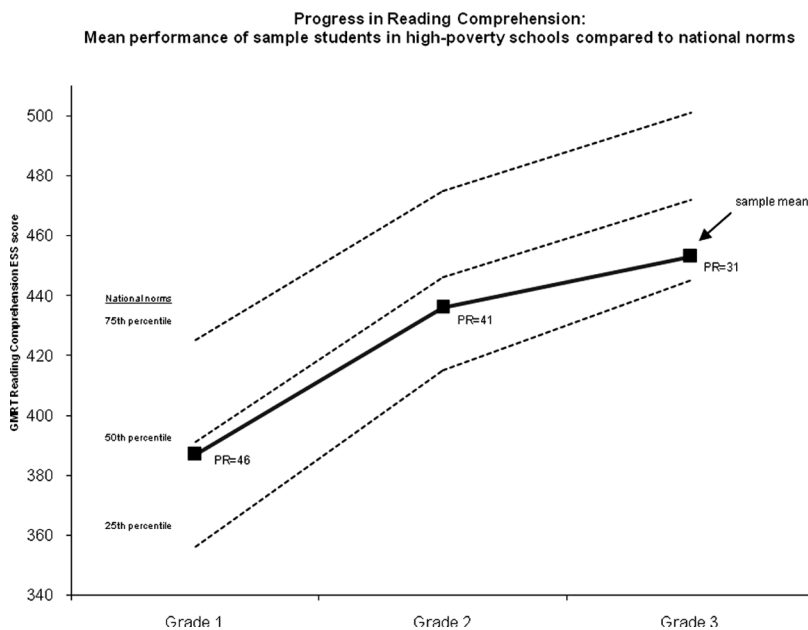

FIGURE 1   Changes in mean reading comprehension percentile ranks (PR) over time.

about 3 months behind grade-level expectations, but by the end of third grade, average scores were about 8 months below expectations.

Figure 1 shows growth in mean reading comprehension scores from the end of Grade 1 to the end of Grade 3. The graph shows that although students expanded their language and literacy skills during the primary grades, their rate of progress in more challenging aspects of reading was not sufficient to keep pace with national norms. For reading comprehension, mean end-of-first-grade scores averaged at the 46th percentile, just slightly below national norms, but mean scores at the end of second grade and the end of third grade showed a leveling-off of performance with an increased gap between study children' achievement and national norms.

Figure 2 shows growth in vocabulary scores, plotting mean raw scores and the corresponding percentile ranks from the beginning of Grade 1 to the end of Grade 2. Study children's initial vocabulary scores were low, averaging only at the 19th percentile at the beginning of first grade. Although average vocabulary improved modestly during first grade, students' average PPVT-III scores at the end of Grade 1 and the end of Grade 2 still reflected delays relative to national norms, averaging only at the 25th percentile.
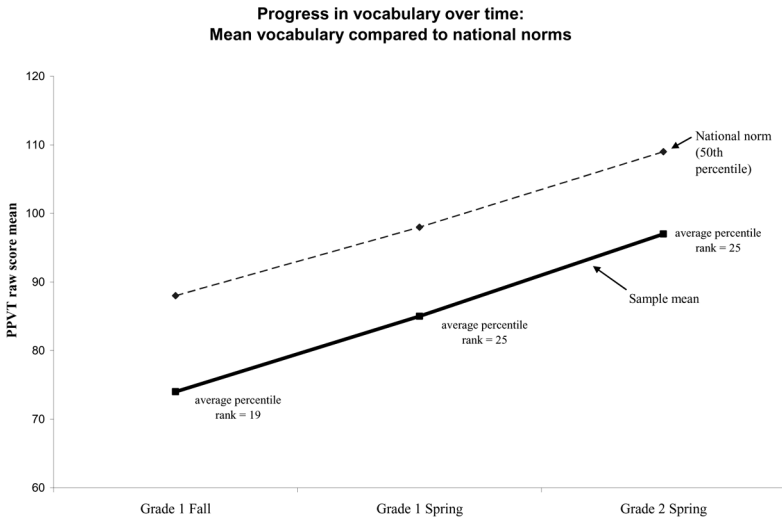
Progress in vocabulary over time:
Mean vocabulary compared to national norms

FIGURE 2   Changes in mean receptive vocabulary percentile ranks over time.

Correlations with Reading Comprehension

Table 3 presents correlations of early literacy measures with reading comprehension at the end of first, second, and third grade. The first three columns show "lagged" correlations, the relationships for adjacent time

TABLE 3
Correlations of Early Language and Literacy Skills with Reading Comprehension Over Time

	Time Interval			
Predictor	*Fall G1 scores to spring G1 reading comprehension*	*Spring G1 scores to spring G2 reading comprehension*	*Spring G2 scores to spring G3 reading comprehension*	*Fall G1 scores to spring G3 reading comprehension*
Letter–word identification	.63	.47	.24	.27
Word attack	.54	.41	.20	.22
Phonemic awareness	.27	.07	—	.28
Vocabulary	.44	.48	.46	.46
Oral discourse	.26	—	—	.21

Note. All correlations greater than .19 are statistically significant at $p < .01$.

points, and the fourth column shows relationships between initial literacy skills at the beginning of first grade and end-of-third-grade reading comprehension.

Correlations between beginning-of-first-grade language and literacy assessments and end-of-first-grade reading comprehension scores, shown in column one, demonstrate the strong effect of early decoding skills. Children who began first grade with relatively strong performance in letter-word identification and word attack tended to do relatively well on reading comprehension at the end of Grade 1. The coefficients for early phonemic awareness, vocabulary, and oral discourse were somewhat lower, but all of the early measures of language and literacy showed positive and statistically significant relationships with end-of-first-grade achievement in reading comprehension.

Column two shows the correlations between end-of-first-grade language and literacy assessments and end-of-second-grade reading comprehension. End-of-first-grade decoding measures were strongly related to Grade 2 reading comprehension, although the magnitude of the correlations was somewhat lower than the corresponding coefficients predicting first-grade reading comprehension achievement. End-of-first-grade performance in phonemic awareness was only weakly correlated, however, with end-of-second-grade reading comprehension. End-of-first-grade vocabulary, on the other hand, showed a strong relationship with reading comprehension at the end of second grade, consistent with the strong role for early first-grade vocabulary in predicting end-of-first-grade comprehension. This trend continued for end-of-second-grade predictors of Grade 3 reading comprehension. The relative importance of the decoding measures (letter–word identification and word attack) decreased, although they remained statistically significant predictors of end-of-third-grade comprehension, although the role of vocabulary appeared quite stable. Vocabulary scores consistently showed correlations of about .45 with reading comprehension, regardless of the grade level and time interval.

The right-most column of Table 3 shows the correlation coefficients between the earliest measures of language and literacy skill from the beginning of first grade and reading comprehension at the end of Grade 3. Early vocabulary showed the strongest relationship with third-grade achievement in reading comprehension. Other measures of language and literacy at the beginning of first grade (letter-word identification, word attack, phonemic awareness, and oral discourse) showed statistically significant but weaker relationships with later reading comprehension. The effects of early decoding skills, measured on the letter and word identification and word attack subtests of the WDRB, appeared to fade over time, contributing less to the prediction of later reading comprehension than to end-of-first-grade comprehension.

Early Vocabulary and Third-Grade Reading Comprehension

Given the heterogeneity of the study sample, varying in home language, gender and ethnicity, it was important to investigate whether the observed relationships between vocabulary and reading comprehension would be consistent across subgroups of children. In addition, because students participated in one of four nationally disseminated reading programs, it was also important to explore whether school programs modified the relationship between beginning vocabulary and later achievement in reading comprehension. To explore these possible effects, multilevel regression techniques were employed.

Table 4 presents the results of a series of regression models used to investigate the relationship of early vocabulary to Grade 3 reading comprehension. PPVT-III vocabulary scores and the GMRT-4 reading comprehension scores were standardized to means of zero and standard deviations of one to facilitate the interpretation of the coefficients; after this transformation the coefficients for students' vocabulary scores represent the correlation between beginning-of-first-grade vocabulary and Grade 3 reading comprehension. This correlation remains statistically significant in all models. The first model presented (Model 1), which includes only early Grade 1 vocabulary as a predictor, indicates an average correlation of .46. The variance components indicate that most of the variability in third-grade reading comprehension is within, rather than between, schools. In other words, all of the low-income study schools included some students who performed relatively well and others who performed very poorly on third grade assessments, and the overall school means did not differ from each other significantly. In addition, the variability in the correlations between reading comprehension and vocabulary across study schools was not quite enough to be statistically significant, indicating that the correlation of vocabulary and comprehension was relatively stable across schools. The pseudo R^2 statistic indicates that about 25% of the variance in Grade 3 reading comprehension is associated with early vocabulary, and the overall R^2 does not change substantially even with the addition of other potential predictors.

The introduction of student-level characteristics such as gender, ethnicity, and home language indicated small and nonsignificant effects, with only the slightly lower mean comprehension scores for children who spoke another home language being strong enough to reach significance. Of particular interest are the interactions terms, as these represent potential differences in the magnitude of the correlations between early vocabulary and reading comprehension. The overall relationship between vocabulary and comprehension was relatively consistent across subgroups of children after controlling for all of the student-level predictors in Model 7. In some of the earlier

TABLE 4
Regression Results: Models Investigating Effects of Grade 1 Vocabulary on Grade 3 Reading Comprehension

Effect	Model 1 Vocabulary	Model 2 School vocabulary	Model 3 Gender	Model 4 Ethnicity	Model 5 Home language	Model 6 Literacy model	Model 7
Intercept	.009	.013	.065	.108	.079	.250*←	.174
Student-level							
Grade 1 vocabulary	.462***←	.438***←	.480***←	.663***←	.522***←	.230**←	.359***←
Female			.143				.132
Black				.156			.234
Hispanic				.123			.042
Non-English					.279*←		.330*←
School-level							
School		.261					.101
mean vocabulary							
Literacy model							
BEL						.275	.310
DLF						.266	.293
LC						.332*←	.367
Interactions							
Vocab × School mean		.259**←					.176
Vocab × Female			.024				.006
Vocab × Black				.245			.213
Vocab × Hispanic				.361**←			.186
Vocab × Non-English					.224*←		.130
Vocab × BEL						.105	.132

(*Continued*)

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TABLE 4
Continued

Effect	Model 1 Vocabulary	Model 2 School vocabulary	Model 3 Gender	Model 4 Ethnicity	Model 5 Home language	Model 6 Literacy model	Model 7
Vocab × DLF						.278	.359
Vocab × LC						.416*←	.472
Variance components							
Intercepts	.024	.009	.025	.019	.016	.0002	.000
Residual	.848	.830	.840	.813	.824	.826	.781
AIC fit statistic	883.8	877.1	879.3	866.5	863.1	880.3	861.7
Pseudo R^2	.250	.255	.252	.275	.259	.252	.288

Note. $n = 280$, although sample sizes vary very slightly due to missing data. For analyses involving Literacy models, Success For All is the baseline group. BEL = Building Essential Literacy. DLF = Developing Literacy First. LC = Literacy Collaborative.
$^*\overline{p} < .05$, $^{**}\overline{p} < .01$, $^{***}\overline{p} < .001$.

models, however, there were some indications that the correlation of early vocabulary with later reading comprehension was somewhat stronger for those students whose early vocabulary scores were relatively high. For the group of students who began first grade with the very lowest vocabulary scores (those who were not native English speakers, for example), the correlation with later reading comprehension was slightly smaller, indicating that at least some of these students were able to make good gains over time, although the overall performance of the students who began first grade with low vocabulary scores remained weak.

In an examination of school-level predictors, mean vocabulary scores were calculated for participating students in each of the 16 study schools to see if schools with higher overall vocabulary scores would show higher levels of reading comprehension or different levels of correlation between vocabulary and comprehension. The results in Table 4 show no indication that the school means for vocabulary were related at all to comprehension at Grade 3, indicating that the relationship of vocabulary to comprehension is a student-level rather than a school-level effect.

Assessing possible influences of the four different literacy models, the results of regression Model 6 indicate a small effect of the literacy models on student levels of reading comprehension in Grade 3, with the LC schools showing slightly high mean comprehension scores than SFA schools. The interaction term indicates that the slope for vocabulary and comprehension was greater for students in LC schools (with an estimated correlation coefficient of .56) compared to the slope for students in SFA schools (estimated correlation of .23). But the results in Model 7 indicate that these differences across the literacy models are no longer significant after controlling for child-level variables such as gender and ethnicity. After adjusting for differences at the student level in home language, for example, the four literacy models did not differ significantly in reading comprehension, and a moderately strong correlation between early vocabulary and Grade 3 reading comprehension was evident across all four of the literacy models that were implemented in the 16 study schools.

Early Vocabulary and Other Early Measures of Literacy Skill

Table 5 presents the results of a series of models in which the effects of early vocabulary on third-grade reading comprehension are assessed in the context of the other skill measures from the beginning of first grade. These results also confirm the consistent positive relationship between early vocabulary knowledge and later reading comprehension, even after controlling for these other early measures, with the coefficients for vocabulary as a predictor averaging over .40. The contributions of the other language and

TABLE 5

Regression Results: Models Investigating Effects of Grade 1 Vocabulary and Other Grade 1 Measures on Grade 3 Reading Comprehension

Effect	Model 1 Vocabulary	Model 2 Letter identification	Model 3 Word attack	Model 4 Phonemic awareness	Model 5 Oral discourse
Intercept	.009	.028	.028	.030	.087
Grade 1 predictors					
Vocabulary	.462***←	.398***←	.412***←	.406***←	.487***←
Letter identification		.080			
Word attack			.037		
Phonemic awareness				.201***←	
Oral discourse					.091
Interactions					
Vocab × Letter identification		.173***←			
Vocab × Word attack			.155**←		
Vocab × Phonemic awareness				.171**←	
Vocab × Oral discourse					.021
Variance components					
Intercepts	.024	.028	.032	.021	.000
Residual	.848	.787	.808	.789	.777
AIC fit statistic	883.8	862.1	871.3	861.3	633.1
Pseudo R^2	.250	.303	.285	.298	.265

Note. $n = 280$. $^{*}\overline{p} < .05$, $^{**}\overline{p} < .01$, $^{***}\overline{p} < .001$.

literacy measures all show smaller positive coefficients, and only the measure of early phonemic awareness is statistically significant. Notice also that the interaction terms for letter-identification, word attack, and phonemic awareness are also positive. This indicates that the relationship of vocabulary to later reading comprehension was slightly stronger for those students who started off with higher initial scores in the different domains of language and literacy assessed. For children with very weak initial language and literacy performances, the correlation with later achievement was somewhat weaker. Overall, the results in Tables 4 and 5 show the consistency of the relationship between early vocabulary and later reading comprehension. Even when controlling for other early measures of student skills, and even when looking across different subgroups of children in a variety of schools and instructional conditions, early vocabulary scores were important predictors of later performance.

Does Early Vocabulary Predict Growth Rates in Reading Comprehension?

Although early vocabulary showed a significant relationship with individual children's levels of reading comprehension at the end of third grade, what were the effects of vocabulary on students' rate of growth in comprehension? Did children with stronger initial vocabularies, for example, accelerate in reading comprehension across the primary grades? To explore this, growth rates in comprehension for children who began first grade with average, lower, and higher vocabulary scores were compared. Figure 3 shows growth trajectories in reading comprehension for students at the top, middle, and bottom quartiles in vocabulary for our sample at the beginning of first grade. Note that these quartile groups are calculated within the Boston low-income sample; national percentile ranks, which are also indicated, are much lower. Figure 3 demonstrates that students who began first grade with stronger vocabularies showed generally higher levels of reading comprehension in Grades 1, 2, and 3, but the relative gaps between lower and higher vocabulary students' reading comprehension did not change over time. The positive finding is that the growth rates in reading comprehension for most students were very similar, regardless of their initial skill levels in vocabulary. The concerning finding is that children who began school with lower vocabularies typically stayed on a lower trajectory in reading comprehension throughout the primary grades, despite the supports of enriched reading instruction. In addition, as Figure 1 illustrates, growth rates in reading comprehension were slow for all groups of children in the sample and showed signs of deceleration in third grade.
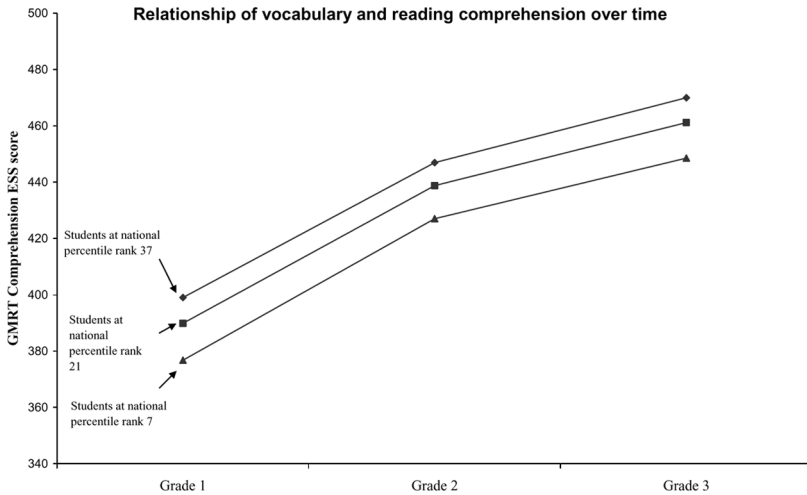
FIGURE 3   Reading comprehension over time for students at the 25th, 50th, and 75th percentiles for the sample in early Grade 1 vocabulary.

DISCUSSION

Consistent with other research, these results from a large longitudinal sample of urban children confirm the importance of the skills children bring with them to the start of formal literacy instruction (Dickinson & Tabors, 2001; Poe et al., 2004; Roth et al., 2002). Even in the context of district-wide literacy reform initiatives, which raised all children's potential for success, children's vocabulary skills at the beginning of first grade made a critical contribution to later achievement in reading comprehension. Work by Hart and Risley (1995), among others, has focused attention on the fact that many low-income children enter school with limited vocabularies. The results here provide evidence that beginning vocabulary levels are important for reading progress even in classrooms like those in the Boston sample that are providing enriched literacy instruction. The impact of vocabulary on reading achievement remains strong even when the diversity in student characteristics is large, and average levels of vocabulary are relatively low.

Findings emphasize the strong and consistent role of vocabulary as a predictor of reading comprehension, a role that becomes relatively more important, compared to other predictors, as children move beyond the first two grades. Other research has pointed to the longer-term impact of kindergarten and first-grade vocabulary on subsequent reading achievement

(Cunningham & Stanovich 1997; Dickinson & Tabors, 2001) and to the particular impact of vocabulary on reading comprehension (Ricketts, Nation, & Bishop, 2007). Early vocabulary remained a strong predictor of second- and third-grade reading for our study children, and beginning levels of other literacy skills (phonemic awareness, letter knowledge, word attack) showed a reduced impact on reading comprehension as children moved beyond first grade.

Analyses of study children's first-grade reading achievement showed the importance of early decoding skills and phonemic awareness in predicting success at the end of first grade, results that are consistent with much of the other literature on beginning reading skills (Juel, 1988; Morris et al., 2003; Torgesen et al., 1999) and with Whitehurst and Lonigan's (2001) emphasis on the importance of inside-out skills. But as all study children gained experience in these basic skills during the first 2 years of elementary school, the relative variability among children in basic decoding skills and phonemic awareness tended to diminish. In the context of reformed and enriched literacy instruction, the focus of our study, most children appeared to acquire at least adequate skills in basic aspects of reading. In phonemic awareness, for example, there were relatively greater differences among study children at the beginning of first grade than there were at the end of first grade, by which time most children in our sample had acquired reasonable levels of awareness, for example, the ability to segment a three-phoneme word. Thus although basic skills in decoding and phonemic awareness remained important components of overall reading success, more of the variability in later reading comprehension was related to differences in children's vocabulary, and the contribution of early vocabulary to reading comprehension continued to be important as children moved beyond the initial stages of learning to read.

Vocabulary skills are important in predicting reading development over time because they are implicated in multiple aspects of reading. Children who begin school with larger vocabularies show greater sensitivity to sound patterns within words (McDowell, Lonigan, & Goldstein, 2007), and thus are advantaged in learning early letter–sound correspondences. As children move beyond the beginning stages of learning to read, breadth of vocabulary supports accurate decoding of less common words— particularly important for a language like English whose spelling is often irregular. Vocabulary size is associated with other aspects of word knowledge such as morphological awareness, a critical component of skilled reading in third grade and beyond (Carlisle & Fleming, 2003). Finally, breadth of vocabulary reflects world knowledge, children's background understandings of domains of experience that are critical underpinnings of discourse comprehension.

Unlike other research, we did not find an accelerating effect of early vocabulary on subsequent reading achievement: Growth rates were very similar for children in our sample with weaker and stronger initial vocabulary levels. Even students with relatively high initial vocabulary scores appeared to face many challenges in developing strong reading comprehension abilities. We suspect that the potentially accelerating effects of vocabulary on reading development may have been offset by risk factors in our study children's school and out-of-school experiences, for example through exposure to weak teaching, family stress, and other factors that disproportionately affect children in high-poverty schools.

Because this study utilized a single, widely used measure of word knowledge, the PPVT-III, results do not provide evidence for a differentiated relationship between diverse aspects of vocabulary (e.g., expressive vs. receptive vocabulary, vocabulary breadth vs. vocabulary depth) and specific aspects of reading (see Ouellette, 2006, for a discussion). Instead, the results confirm a strong relationship between the breadth of children's receptive vocabulary and reading comprehension.

There is reason for concern in the patterns of literacy growth documented for the cohort of children in these 16 urban schools. Despite very good scores in decoding and a reasonably good start in reading comprehension at the end of first grade, the relatively slow rates of growth in comprehension ability during Grade 2, and especially in Grade 3, show the challenges that many urban students confront as they encounter increasingly difficult reading material. Second- and third-grade passages on the GMRT-4, like passages encountered in classroom reading materials, contained more words not used in everyday conversation, and comprehension questions began to require more precise and detailed understandings of passage content. Despite other achievements of Boston's literacy reform models, for example, in supporting excellent word identification skills, the literacy reforms were not effective in improving average vocabulary levels beyond first grade. Persistently weak vocabulary appeared to limit the study children's growth in comprehension abilities and to contribute to a decline in comprehension scores relative to national norms in second and particularly third grade.

But there may be some signs of success and potential for future efforts. The district's strong emphasis on developing fluency produced word-recognition skills that averaged well above national norms. Expanded classroom libraries, home reading programs, a city-wide emphasis on writing development, and expanded time on task, through the institution of district-wide literacy blocks, were effective components of nearly all of the study children's literacy experience and may have contributed to very good average achievement in word reading.

Building on the success of district reform efforts is important, but our analyses suggest that reforms must also target the language skills that children develop in preschool and kindergarten. Efforts at vocabulary instruction have been directed at older children (Beck, McKeown, & Kucan, 2002; Carlo et al., 2004) and relatively limited attention has been given to vocabulary instruction in early childhood and primary grade classrooms. New approaches to vocabulary instruction for young children, however, can complement the growing emphasis on decoding skills in many urban preschools and kindergartens (De Temple & Snow, 2003; Jordan, Snow, & Porche, 2000; Schwanenflugel et al., 2005; Silverman, 2007).

The analyses presented focus primarily on relationships at the student level; however there were also differences evident among schools and among teachers in the overall levels of student language and literacy achievement. Nye, Konstantopolous, and Hedges (2004), in a large-scale study of variability across teachers and schools, identified larger teacher effects on student achievement in schools with lower as opposed to higher socioeconomic status levels. In other analyses we have conducted for this sample of 16 high-poverty schools, teacher effects and school effects on literacy achievement were both larger than the effects accounted for by the four literacy models that the schools had adopted (Tivnan & Hemphill, 2005).

What is needed now is greater attention to those schools and teachers who are achieving relatively good success, for example, classrooms in which a majority of low-income students reach challenging levels in reading comprehension and experience substantial growth in vocabulary. The presence of such classrooms in our study shows it is possible for urban students to perform well, and that the right mix of emphasis on language skills and early literacy skills can lead to greater success. The challenge will be to improve our understanding of all of the components of literacy development in low-income children by more carefully delineating the shifting nature of these relationships as children move from beginning to later stages of literacy development.

REFERENCES

Barone, D. (2002). Literacy teaching and learning in two kindergarten classrooms in a school labeled at-risk. *Elementary School Journal*, 102, 415–441.

Beck, I. L., McKeown, M. G., & Kucan, L. (2002). *Bringing words to life: Robust vocabulary instruction*. New York: Guilford.

Britto, P. R., Brooks-Gunn, J., & Griffin, T. M. (2006). Maternal reading and teaching patterns: Associations with school readiness in low-income African American families. *Reading Research Quarterly*, 41, 68–89.

Carlisle, J. F., & Fleming, J. (2003). Lexical processing of morphologically complex words in the elementary years. *Scientific Studies of Reading*, 7, 239–253.

Carlo, M. S., August, D., McLaughlin, B., Snow, C. E., Dressler, C., Lippman, D. N., et al. (2004). Closing the gap: Addressing the vocabulary needs of English-language learners in bilingual and mainstream classrooms. *Reading Research Quarterly*, 39, 188–215.

Craig, H. K., Connor, C. M., & Washington, J. A. (2003). Early positive predictors of later reading comprehension for African American students: A preliminary investigation. *Language, Speech, and Hearing Services in Schools*, 34, 31–42.

Cunningham, A. E., & Stanovich, K. E. (1997). Early reading acquisition and its relation to reading experience and ability 10 years later. *Developmental Psychology*, 33, 934–945.

Datnow, A., & Castellano, M. (2000). *An inside look at Success for All: A qualitative study of implementation and learning and teaching* (Report No. 45). Baltimore: Center for Research on the Education of Students Placed at Risk.

de Jong, P. F., & van der Leij, A. (2002). Effects of phonological abilities and linguistic comprehension on the development of reading. *Scientific Studies of Reading*, 6, 51–77.

De Temple, J., & Snow, C. E. (2003). Learning words from books. In A. van Kleeck & S. Stahl (Eds.), *On reading books to children* (pp. 16–36). Mahwah, NJ: Lawrence Erlbaum Associates.

Dickinson, D. K., & McCabe, A. (2001). Bringing it all together: The multiple skills, origins, and environmental supports of early literacy. *Learning Disabilities Research and Practice*, 16, 186–202.

Dickinson, D. K., McCabe, A., Anastasopoulos, L., Peisner-Feinberg, E. S., & Poe, M. D. (2003). The comprehensive language approach to early literacy: The interrelationships among vocabulary, phonological sensitivity, and print knowledge among preschool-aged children. *Journal of Educational Psychology*, 95, 465–481.

Dickinson, D. K., & Tabors, P. O. (Eds.). (2001). *Beginning literacy with language: Young children learning at home and school*. Baltimore, MD: Paul H. Brookes.

Dowsett, C. J., Huston, A. C., Imes, A. E., & Gennetian, L. (2008). Structural and process features in three types of child care for children from high and low income families. *Early Childhood Research Quarterly*, 23, 69–93.

Dunn, L., & Dunn, L. (1997). *Peabody Picture Vocabulary Test, 3rd Edition (PPVT-3)*. Circle Pines, MN: American Guidance Services.

Farver, J. M., Xu, Y., & Eppe, S. (2006). Home environments and young Latino children's school readiness. *Early Childhood Research Quarterly*, 21, 196–212.

Fuller, B., Eggers-Piérola, C., Holloway, S., & Rambaud, M. (1996). Rich culture, poor markets: Why do Latino parents forego preschooling?. *Teachers College Record*, 97, 400–418.

Griffin, T. M., Hemphill, L., Camp, L., & Wolf, D. P. (2004). Oral discourse in the preschool years and later literacy skills. *First Language*, 24, 123–147.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore, MD: Paul H. Brooks.

Hemphill, L., Feldman, H., Camp, L., Griffin, T., Miranda, A. E., & Wolf, D. P. (1994). Developmental changes in narrative and non-narrative discourse in children with and without brain injury. *Journal of Communication Disorders*, *27*, 107–133.

Hill, P. W., & Jaggar, A. M. (2003). *An evaluation report on the impact of Mondo Publishing's Building Essential Literacy (BEL) design and Bookshop Reading Program: 1998–1999 and 1999–2000 school years*. New York: Mondo.

Hoff, E. (2006). Environmental supports for language acquisition. In D. K. Dickinson & S. B. Neuman (Eds.), *Handbook of early literacy development* (Vol. 2, pp. 163–172). New York: Guilford.

Jordan, G. E., Snow, C. E., & Porche, M. V. (2000). Project EASE: The effect of a family literacy project on kindergarten students' early literacy skills. *Reading Research Quarterly*, *35*, 524–546.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology*, *80*, 437–447.

Lee, J., Grigg, W. S., & Donahue, P. L. (2007). *The nation's report card: Reading 2007*. Washington, DC: National Center for Educational Statistics.

Lutkus, A. D., Grigg, W., & Donahue, P. L. (2007). *The nation's report card: 2007 trial urban district assessment in reading*. Washington, DC: National Center for Educational Statistics.

Lutkus, A. D., & Weiner, A. W. (2003). *The nation's report card: Trial urban district assessment reading highlights, 2003*. Washington, DC: National Center for Educational Statistics.

MacGinitie, W. H., MacGinitie, R. K., Maria, K., & Dreyer, L. (2000). *The Gates–MacGinitie Reading Tests* (4th Ed.). Itasca, IL: Riverside.

Mason, J., Stewart, J., Peterman, C., & Dunning, D. (1992). *Toward an integrated model of early reading development* (Tech. Rep. No. 566). Champaign, IL: Center for the Study of Reading.

McDowell, K. D., Lonigan, C. J., & Goldstein, H. (2007). Relations among socioeconomic status, age, and predictors of phonological awareness. *Journal of Speech, Language, and Hearing Research*, *50*, 1079–1092.

Missall, K., Reschly, A., & Betts, J. (2007). Examination of the predictive validity of preschool early literacy skills. *School Psychology Review*, *36*, 433–452.

Morris, D., Bloodgood, J., & Perney, J. (2003). Kindergarten predictors of first and second grade reading achievement. *The Elementary School Journal*, *104*, 93–109.

Neuman, S. B., & Celano, D. (2001). Access to print in low- and middle-income communities: An ecological study of four neighborhoods. *Reading Research Quarterly*, *36*, 8–26.

Nye, B., Konstantopolous, S., & Hedges, L. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis*, *26*, 237–257.

Ouellette, G. P. (2006). What's meaning got to do with it: The role of vocabulary in word reading and reading comprehension. *Journal of Educational Psychology*, *98*, 554–565.

Poe, M. D., Burchinal, M. R., & Roberts, J. E. (2004). Early language and the development of children's reading skills. *Journal of School Psychology*, *42*, 315–332.

Ravid, D., & Tolchinsky, L. (2002). Developing linguistic literacy: A comprehensive model. *Journal of Child Language*, *29*, 417–447.

Ricketts, J., Nation, K., & Bishop, D. V. (2007). Vocabulary is important for some, but not all reading skills. *Scientific Studies of Reading*, *11*, 235–257.

Roth, F. P., Speece, D. L., & Cooper, D. H. (2002). A longitudinal analysis of the connection between oral language and early reading. *Journal of Educational Research*, *95*, 259–272.

Schatschneider, C., Francis, D. J., Carlson, C. D., Fletcher, J. M., & Foorman, B. F. (2004). Kindergarten prediction of reading skills: A longitudinal comparative analysis. *Journal of Educational Psychology*, *96*, 265–282.

Schwanenflugel, P. J., Hamilton, C. E., Bradley, B. A., Ruston, H. P., Neuharth-Pritchett, S., & Restrepo, M. A. (2005). Classroom practices for vocabulary in prekindergarten. In E. H. Hiebert & M. L. Kamil (Eds.), *Teaching and learning vocabulary: Bringing research to practice* (pp. 155–177). Mahwah, NJ: Lawrence Erlbaum Associates.

Sénéchal, M., & LeFevre, J.-A. (2002). Parental involvement in the development of children's reading skill: A five-year longitudinal study. *Child Development*, *73*, 445–460.

Shapiro, L. R., & Hudson, J. A. (1991). Tell me a make-believe story: Coherence and cohesion in young children's picture-elicited narratives. *Developmental Psychology*, *27*, 960–974.

Silverman, R. D. (2007). Vocabulary development of English-language and English-only learners in kindergarten. *The Elementary School Journal*, *107*, 365–383.

Snow, C. E., & Dickinson, D. K. (1991). Some skills that aren't basic in a new conception of literacy. In A. Purves & T. Jennings (Eds.), *Literate systems and individual lives: Perspectives on literacy and schooling* (pp. 175–213). Albany, NY: SUNY Press.

Snow, C. E., Tabors, P. O., Nicholson, P. A., & Kurland, B. F. (1995). SHELL: Oral language and early literacy skills in kindergarten and first-grade children. *Journal of Research in Childhood Education*, *10*, 37–48.

Spira, E. G., Bracken, S. S., & Fischel, J. E. (2005). Predicting improvement after first-grade reading difficulties: The effects of oral language, emergent literacy, and behavior skills. *Developmental Psychology*, *41*, 225–234.

Tivnan, T., & Hemphill, L. (2005). Comparing four literacy reform models in high-poverty schools: Patterns of first-grade achievement. *The Elementary School Journal*, *105*, 419–441.

Torgesen, J. K., Wagner, R. K., Rashotte, C. A., Rose, E., Lindamood, P., Conway, T., & Garvan, C. (1999). Preventing reading failure in young children with phonological processing disabilities: Group and individual responses to instruction. *Journal of Educational Psychology*, *91*, 579–593.

Vernon-Feagans, L. (1996). *Children's talk in communities and classrooms*. Cambridge, MA: Blackwell.

Walston, J., & West, J. (2004). *Full-day and half-day kindergarten in the United States: Findings from the Early Childhood Longitudinal Study* (NCES 2004–78). Washington, DC: National Center for Education Statistics.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development*, *68*, 848–872.

Whitehurst, G. J., & Lonigan, C. J. (2001). Emergent literacy development: From prereaders to readers. In S. B. Neuman & D. K. Dickinson (Eds.), *Handbook of early literacy research* (pp. 11–29). New York: Guilford.

Williams, E. J., Scharer, P. L., & Pinnell, G. S. (2000). *Literacy Collaborative: 2000 research report*. Columbus, OH: Ohio State University.

Woodcock, R. W. (1997). *Woodcock Diagnostic Reading Battery*. Itasca, IL: Riverside.

Yopp, H. (1995). Yopp–Singer Test of Phoneme Segmentation. *Reading Teacher*, *49*, 20–29.

APPENDIX A
A Key Characteristics of Literacy Instruction within the Literacy Models Implemented in Study Schools

Characteristic	Building Essential Literacy	Developing Literacy First	Literacy Collaborative	Success for All
Time allocation	120 min	90 min	120 min	90 min
Grouping	Whole class and small homogeneous groups	Whole class and small homogeneous groups	Whole class and small homogeneous groups	Whole class instruction for homogeneous groups of 8–20 students
Materials	Leveled books, big books, basal anthologies	Leveled books, big books, picture and chapter books	Leveled books, big books, picture and chapter books	Roots decodable readers and basal anthologies
Word study	Eclectic but largely incidental teaching	Eclectic: direct instruction, worksheets, also incidental teaching	Embedded in reading and writing instruction; mainly incidental	Systematic, direct instruction of phonics principles in first grade
Writing instruction	Daily writing block	Variable; included in some classrooms and not in others	Daily writing block	Not supported by the model