

Research Brief

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Making the Most of Extra Time: Relationships Between Full-Day Kindergarten Instructional Environments and Reading Achievement

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SUMMARY

As the number of schools changing from part- to full-day kindergarten programs increases, state and local education agencies need empirically-based evidence on ways that schools and teachers can best structure the additional instructional time of full-day programs to improve children's early reading skills. This brief uses nationally representative data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) to explore relationships between full-day kindergarten program factors and public school children's gains in reading scores from the fall to spring of the kindergarten year. Results from the study provide evidence that:

- » Children in kindergarten programs that devote a larger portion of the school day to academic instruction, and to reading instruction in particular, make greater gains in reading over the school year than children who spend less time in such instruction.
- » Children tend to make optimal gains in reading when teachers use an equal balance of discrete literacy skills and comprehension skills instruction.
- » Class size interacts significantly with some instructional practices to increase or decrease children's average reading gains in kindergarten.

In summary, this brief provides some of the first evidence on how full-day kindergarten programs might structure instructional resources and practices in ways that prepare children for first grade and later school success.

Introduction

Quality early childhood educational programs have the potential to improve young children's learning and to prepare them for school success. One such program is full-day kindergarten, which provides young children with additional hours of in-school time beyond what is available in a part-day kindergarten setting. In full-day programs, teachers ideally have more time in the school day to get to know their students and to individualize instruction. The longer school day also provides teachers and schools with greater flexibility in decisions about how to allocate instructional time and resources to provide opportunities for children to acquire the early academic skills taught in kindergarten.



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Full-day kindergarten has become more prevalent over time, with enrollment growing from 11 percent of kindergartners in 1969 to 63 percent in 2002 (Ackerman, Barnett, and Robin, 2005; Kauerz, 2005). Prior research tends to confirm that at the end of the school year, children who attend full-day kindergarten programs make more progress in their early reading skills than children who attend part-day programs (Fusaro, 1997; Walston and West, 2004). However, less is known about how schools and teachers can best structure the additional scheduled time available in full-day programs to increase early developmental outcomes and to prepare children for first grade and later schooling.

Prior research on full-day kindergarten often has focused on comparing the academic outcomes of full-day versus part-day kindergartners. Such a technique in essence aggregates all full-day kindergarten programs into a single category as if the programs are identical in nature, even though research demonstrates that kindergarten classrooms vary in the way reading instruction is organized and delivered. For example, kindergarten programs can differ in terms of time devoted to reading instruction, grouping arrangements, instructional activities, curricular emphasis, and other instructional aspects (Connor, Morrison, and Katch, 2004; Meyer, Waldrop, Hastings, and Linn, 1993; Nielson, 1996; Pianta, LaParo, Payne, Cox, and Bradley, 2002). As a result, studies that compare full-day and part-day kindergarten programs without considering the classroom instructional environment may be concealing or distorting differences in how such programs influence child outcomes.

As state and local education agencies begin to implement full-day kindergarten programs, they need empirically-based evidence on full-day classroom factors that are conducive to improving children's reading skills. This brief takes a unique approach by focusing solely on full-day kindergarten settings and by disaggregating the full-day kindergarten environment into time-related classroom factors that may vary across teachers and schools to examine relationships between the different factors and children's

gains in reading during kindergarten. The study concentrates on instructional time use, one of the most important resources available to schools. The results of this approach can inform researchers, policymakers, and educators about full-day kindergarten instructional aspects that are linked with positive outcomes in children's reading achievement.

Reading: A Key Goal of Kindergarten Programs

A top priority of many kindergarten programs is to prepare children to read. Education researchers and organizations, including the National Association for the Education of Young Children (NAEYC) and the International Reading Association (IRA), view early literacy development as the foundation for children's school success given the importance of literacy in society. Children's kindergarten reading achievement is a strong predictor of their reading achievement as they progress through school (Entwisle and Alexander, 1998; LaParo and Pianta, 2000; Rathbun and West, 2004; Snow, Burns, and Griffin, 1998). Children who are more proficient in reading also tend to be more successful in other subject areas, such as science and social studies, because they are better able to comprehend the subject-specific vocabulary presented in text and trade books (Harmon, Hedrick, and Wood, 2005; Allington, 2001).

Conceptions about appropriate kindergarten time allocation to reading curriculum and instruction have varied over time and across programs in response to periodic shifts in philosophies about the nature of child development as well as shifts in policies about the role of public schools in educating young children (Bryant, Clifford, and Peisner, 1991; Spodek, 1988). The NAEYC and some child development experts recommend that kindergarten in-school time should be devoted primarily to free play that provides children with opportunities to select from different activities and learning materials (Bryant, Clifford, and Peisner, 1991; Huffman and Speer, 2000; Stipek, Fieler, Daniels, and Milburn, 1995). According to this philosophy, children's development is perceived to be enhanced in settings that

promote child-centered activities. In such settings, teachers play the role of facilitator instead of director as children engage in learning. Many of the recommendations for kindergarten programs consistent with this philosophy are based on empirical evidence gathered from effective preschool programs.

An alternative philosophy to kindergarten instruction is the shift in academic curriculum from the higher grades down to the kindergarten level (Shepard and Smith, 1988). This philosophy has become increasingly common as public school systems respond to pressures from policymakers and the public for greater school accountability. In this paradigm, kindergarten programs

are designed to prepare all children to be able to read by the time they reach third grade. Advocates for this more teacher-directed, academically-focused instructional approach recommend that kindergarten time be used to focus on strategies such as phonemic awareness (e.g., recognition that spoken words are conceived from separate sounds), guided oral reading, and applying reading comprehension strategies to guide and improve reading instruction. Although researchers acknowledged the escalating kindergarten demands as early as the 1980's, the academically-directed philosophy toward reading instruction in the early grades seems to be more widespread with the passage of the No Child Left Behind Act of 2002.

Study Methodology

Data for this study come from the Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 survey (ECLS-K). Sponsored by the U.S. Department of Education's National Center for Education Statistics (NCES), the ECLS-K features a large, nationally representative sample of 21,260 kindergartners from diverse family backgrounds who attended schools with kindergarten programs in the 1998–99 school year. Sampling for the ECLS-K was based on a multistage sampling design. The first stage of sampling involved the selection of a national sample of 100 counties and county groups. Schools were then selected within the counties/county groups, and approximately 23 students were sampled from each of the selected schools. In the fall of 1998, approximately 52 percent of children in public schools attended kindergartens identified by schools as being "full-day" programs.¹ The ECLS-K collected data directly from children and their parents, teachers, and schools in the fall and spring of kindergarten, the fall and spring of first grade, the spring of third grade, the spring of fifth grade, and the spring of eighth grade. However, this study used only data collected during the kindergarten year in the fall of 1998 and the spring of 1999. Below is a brief description of the data collection instruments and key variables used in the study.

Reading Gains Outcome Measure. Trained ECLS-K assessors used computer-assisted personal interviews to conduct one-on-one testing with children in reading, mathematics, and general knowledge in the fall and spring of the sample's kindergarten year. The reading score reflects children's knowledge of basic skills (e.g., print familiarity, letter and word recognition), receptive vocabulary (e.g., recognition of written or spoken words), and comprehension. Children's kindergarten reading gain, based on the difference between their fall and spring kindergarten reading scale scores, was used as the outcome measure for the study.

Classroom Factors. Kindergarten teachers completed paper questionnaires in the fall and spring about the classroom environment. This study focuses on two aspects of kindergarten learning environments: instructional resources and instructional practices. Instructional resources used in the analysis include (1) class size and (2) the presence of instructional aides who work directly with children on instructional activities. These instructional resources in full-day kindergarten classrooms may help to reduce the child-teacher ratio and thus increase the potential amount of time available for teachers to spend with each child in the classroom.

Full-day kindergarten also may allow teachers more time to tailor their instructional practices in ways that can enhance children’s reading achievement. Instructional practice constructs used in the analysis include (1) proportion of time devoted to whole-class instruction and child-selected activities, (2) use of reading achievement groups for instruction, (3) proportion of time devoted to reading instruction relative to total academic instruction time (i.e., reading, math, science, and social studies), (4) proportion of time devoted to academic instruction relative to total instruction time (i.e., academic time plus time spent in music, art, and physical education), and (5) emphasis on different types of reading instructional activities (e.g., reading aloud to children, working on letter names, and doing reading worksheets) and skills (e.g., letter recognition, rhyming words, using context cues for comprehension). The analysis also included interactions between instructional resources and practices.

Control Variables. Several child-, family-, and school-level variables were included as statistical controls in the analysis to better isolate relationships between kindergarten classroom factors and kindergarten gains in reading achievement and to increase power for hypothesis testing in multilevel modeling (Raudenbush and Bryk, 2002). Child and family control variables included children’s age at school entry, gender, race/ethnicity, initial score on the reading assessment in the fall of kindergarten, the elapsed time between the fall and spring assessments, and family socioeconomic status (SES). School control variables included the school region, urbanicity designation, mean fall reading score for all sample children in the school, and the mean school SES (based on the SES of all sample children in the school).

Exploring Relationships Between Classroom Factors and Kindergarten Reading Gains

This study was conducted within the framework of school effects research, which hypothesizes that improvements in children’s learning can occur at multiple, nested, levels of the education system: specifically, at the child, the classroom, and the school level (Lee, 2000; Raudenbush and Bryk, 2002). Figure 1 provides a conceptual map of the hypothesized relationships between full-day kindergarten instructional resources, teachers’ instructional practices, and full-day kindergartners’ gains in reading achievement.

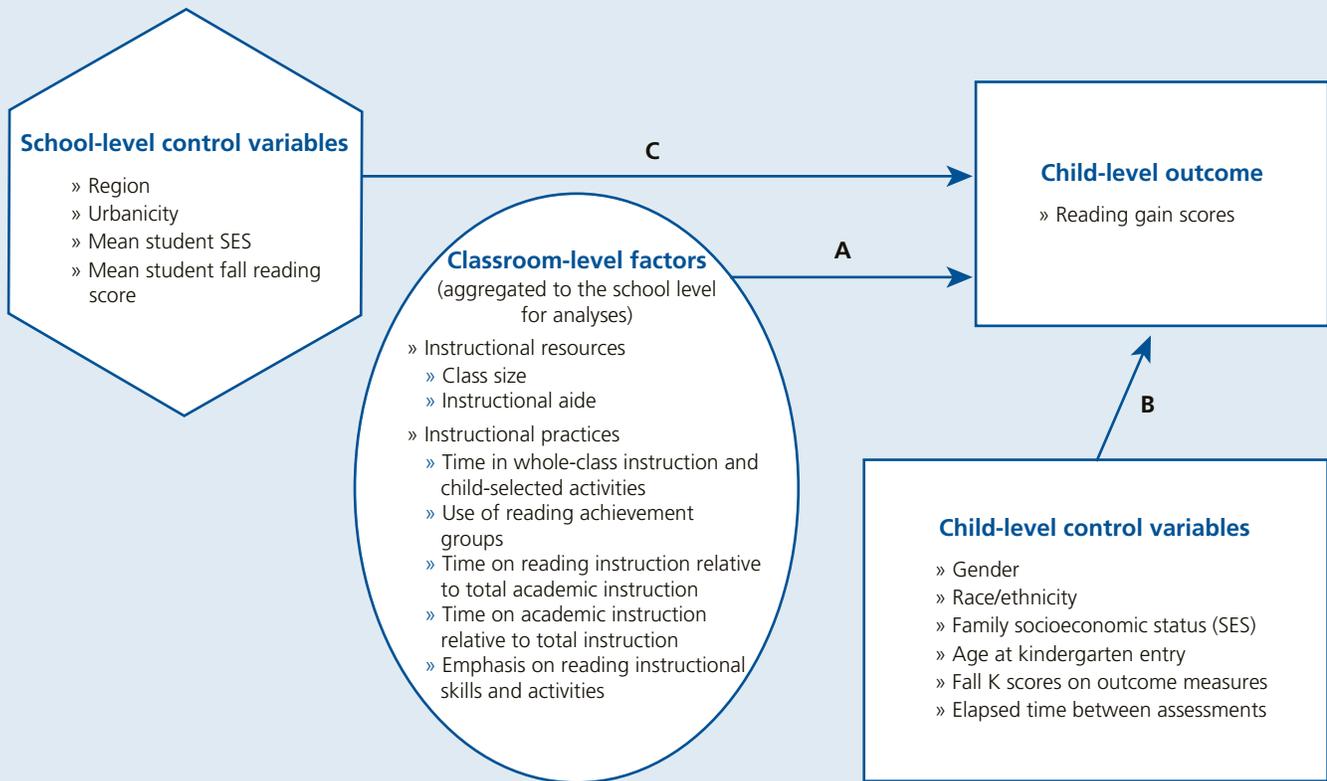
Principal components analysis (PCA) was conducted to identify a reduced set of instructional practice scales based on the larger sets of individual reading activities (23 items) and reading skills (19 items) collected through the ECLS-K teacher questionnaires. The PCA yielded four reading instructional practice scales for use in the final models to

represent the fifth instructional practice construct (i.e., emphasis on reading activities and skills). The resulting scales indicated the frequency that children were exposed to:

- » Child-initiated activities (e.g., choosing own books to read, journal writing),
- » Discrete literacy skills (e.g., reading from basal (structured reading/language arts) texts, practicing conventional spelling),
- » Comprehension skills (e.g., making predictions, identifying main idea and parts of a story), and
- » Discrete letter-sound knowledge skills (e.g., matching letters to sounds, learning letter names).

Next, hierarchical linear modeling (HLM) procedures were used to investigate the effects of full-day kindergarten classroom factors (i.e., instructional resources and instructional practices) on children’s reading gains over the kindergarten year. The HLM

Figure 1. Conceptual framework for relationships between full-day kindergarten instructional resources, instructional practices, and kindergartners' reading achievement gains



framework recognizes the nested structure of children within classrooms and classrooms within schools (Lee, 2000; Raudenbush and Bryk, 2002). HLM can simultaneously model relationships within and across multiple levels of analysis. Level 1 of the HLM model included the children's reading gain score as the outcome measure, with child- and family-level control variables as predictors. Level 2 of the HLM model included the classroom factor variables (aggregated to the school level) and school-level controls as predictors of the level 1 intercept to explore whether some classroom factors were associated with increases in overall reading gains.²

Classroom Factors Are Associated with Differences in Children's Early Reading Gains

Based on the HLM analysis, full-day kindergarten instructional resources and practices were observed to have direct and interactive effects

on children's gains in reading achievement during kindergarten. Significant classroom factors include the proportion of time spent on reading instruction relative to total academic instruction time, the proportion of time devoted to academic instruction relative to total instruction time, and the emphasis placed on different types of reading instructional activities. Other classroom factors that interact in their association with reading gains included kindergarten average classroom size, the use of achievement grouping, and the proportion of time devoted to whole-class instruction vs. other grouping techniques. Highlights of findings are discussed below.

Increasing Reading Instructional Time

On average, full-day kindergartners spent about three-quarters of the instructional day on academic subjects (i.e., reading, mathematics, science, and social studies), with about half of academic time spent on reading instruction. Children in full-day kindergarten programs that devoted a greater

than average proportion of the instructional day to academic subjects relative to total instructional time tended to make greater reading progress in kindergarten. Similarly, children in programs that devoted a greater than average proportion of academic time to reading instruction relative to the total academic instruction time made more reading progress. For example, increasing the percentage of academic instructional time by one standard deviation, from an average of 77 percent to 84 percent of total instructional time,³ translated to a 0.05 standard deviation increase in children's reading gains. Similarly, increasing the percentage of reading instruction by one standard deviation, from 48 percent to 56 percent of academic instructional time, translated to a 0.09 standard deviation increase in reading gains. In essence, the more time spent on academic instruction, especially on reading, the greater the increase in full-day kindergartners' reading achievement.

The finding of a positive link between reading instructional time and reading gains is consistent with prior research on time allocation, which documents that time allocation to specific instructional subjects is positively related to learning in those subjects (Berliner, 1990; Coates, 2003; Cotton, 1989). The finding of a link between overall academic time and reading gains is also consistent with Coates' (2003) finding that increased instruction in mathematics and social studies, in addition to English instruction, can improve reading achievement.

Providing a Balance of Discrete Literacy Skills and Comprehension Skills Instruction

Full-day kindergartners participated in discrete literacy skills instruction an average of almost two days per week, child-initiated activities slightly more than two days a week, comprehension skills instruction about three days per week, and letter-sound knowledge skills more than four days per week. Figures 2 and 3 present the frequency of individual reading instructional activities that comprise the comprehension and discrete literacy skills scales. Results from this study show that

children made greater gains in reading when discrete literacy skills were taught more often than average and comprehension skills were taught less often than average. The HLM coefficients indicate that each 1 standard deviation (SD) increase in the frequency of discrete literacy skills activities was related to a 0.16 SD increase in mean reading gains, while each 1 SD increase in the frequency of comprehension activities was related to a 0.17 SD decrease in mean reading gains.

Further exploration suggests that children tended to make optimal reading gains when teachers used an equal balance of discrete literacy skills and comprehension skills instruction. For example, increasing the frequency of discrete skills instruction one standard deviation, from the reported average of 1.9 days/week to 2.6 days/week, and decreasing the frequency of comprehension-based skills instruction one standard deviation, from the average of 3.1 days/week to 2.5 days/week, would translate to an increase of one-third of a standard deviation in kindergarten reading gains.⁴ The notion of balanced reading instruction, which incorporates systematic code instruction along with meaningful reading and writing activities, is supported by prior research and by reading experts (Guarino et al., 2006; NAEYC, 1998; Pressley, Rankin, and Yokoi, 1996; Snow, Burns, and Griffin, 1998; Xue and Meisels, 2004).

The other two reading instructional scales, children's frequencies of practice on discrete letter-sound knowledge and on child-initiated activities, were not associated with their kindergarten reading gains. One potential reason why discrete letter-sounds knowledge practice was not significantly associated with reading gains could be because its frequency did not vary much across schools. Most teachers reported practicing discrete letter-sound knowledge on almost a daily basis. As for the non-significant relationships between the child-initiated activities scale and reading gains, one reason for this finding may be that many of the specific variables that compose the scale are writing-based activities, which are not directly measured in the ECLS-K reading assessment.

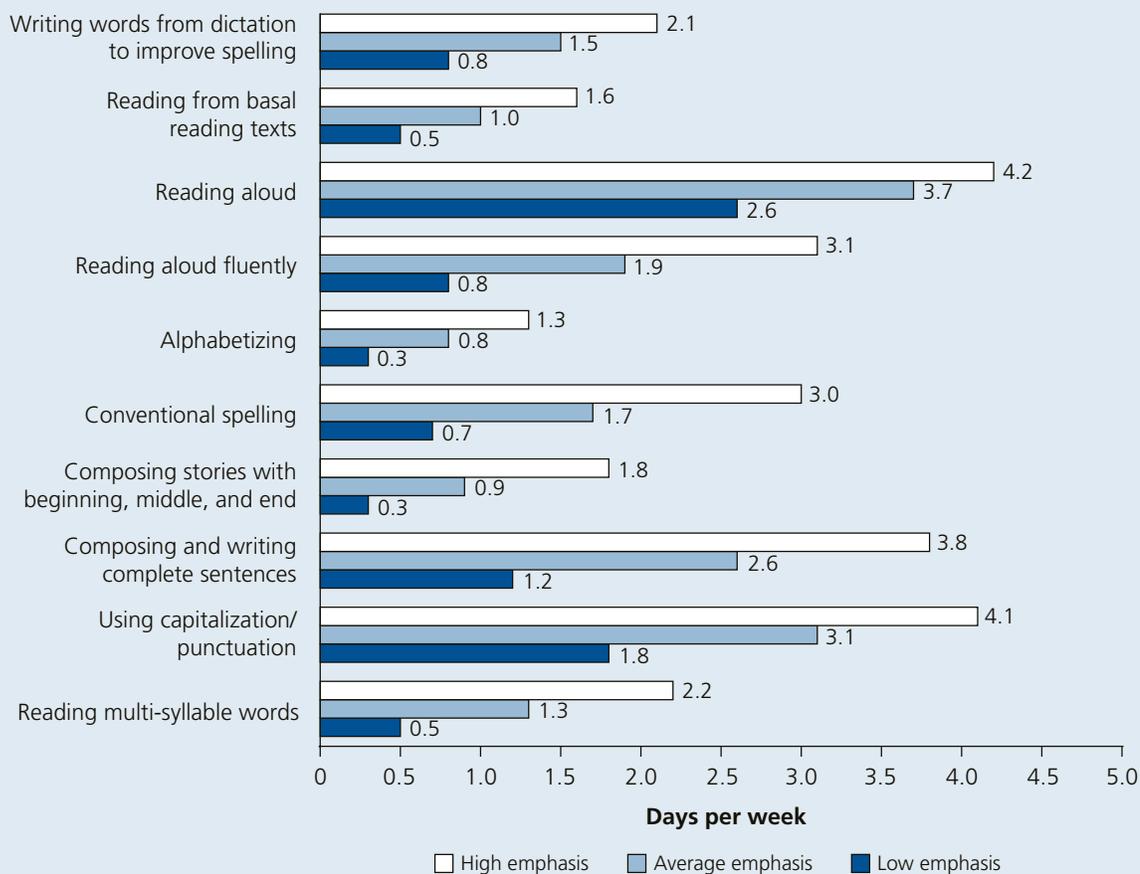
Implementing Instructional Practices that Benefit a Given Class Size

Class size interacted significantly with some grouping strategies and instructional practices to increase or decrease kindergartners' average reading gains in schools. The average ECLS-K full-day kindergarten class size in the fall of 1998 was 21 students, with a range of 9 to 30 students. Children spent about 38 percent of the day in teacher-directed, whole-class grouping arrangements and about one hour per week in reading achievement groups. Neither the main effects of whole class instruction nor reading achievement groups were associated with reading gains, but each had a

significant interaction with the average class size in schools. Children in larger than average classrooms made greater reading gains when they spent more than the average amount of time in reading achievement groups. On the other hand, children in larger than average classrooms made smaller reading gains as their proportion of time in whole-class grouping increased. Furthermore, the reading gains attributable to more frequent instruction in discrete literacy skills decreased as average class size increased. In other words, the benefit of frequent discrete literacy skills practice on kindergarten reading gains was reduced in schools with larger classes.

Figure 2. Frequency of individual reading practices that comprise the discrete literacy skills scale, by amount of emphasis teachers place on discrete literacy skills in full-day kindergarten programs

Individual reading practices



NOTE: This figure is based on a sample of 331 public schools that offer full-day kindergarten programs. Low emphasis is defined as less than -0.5 standard deviations below average emphasis on the discrete literacy scale; high emphasis is defined as more than 0.5 standard deviations above average emphasis.

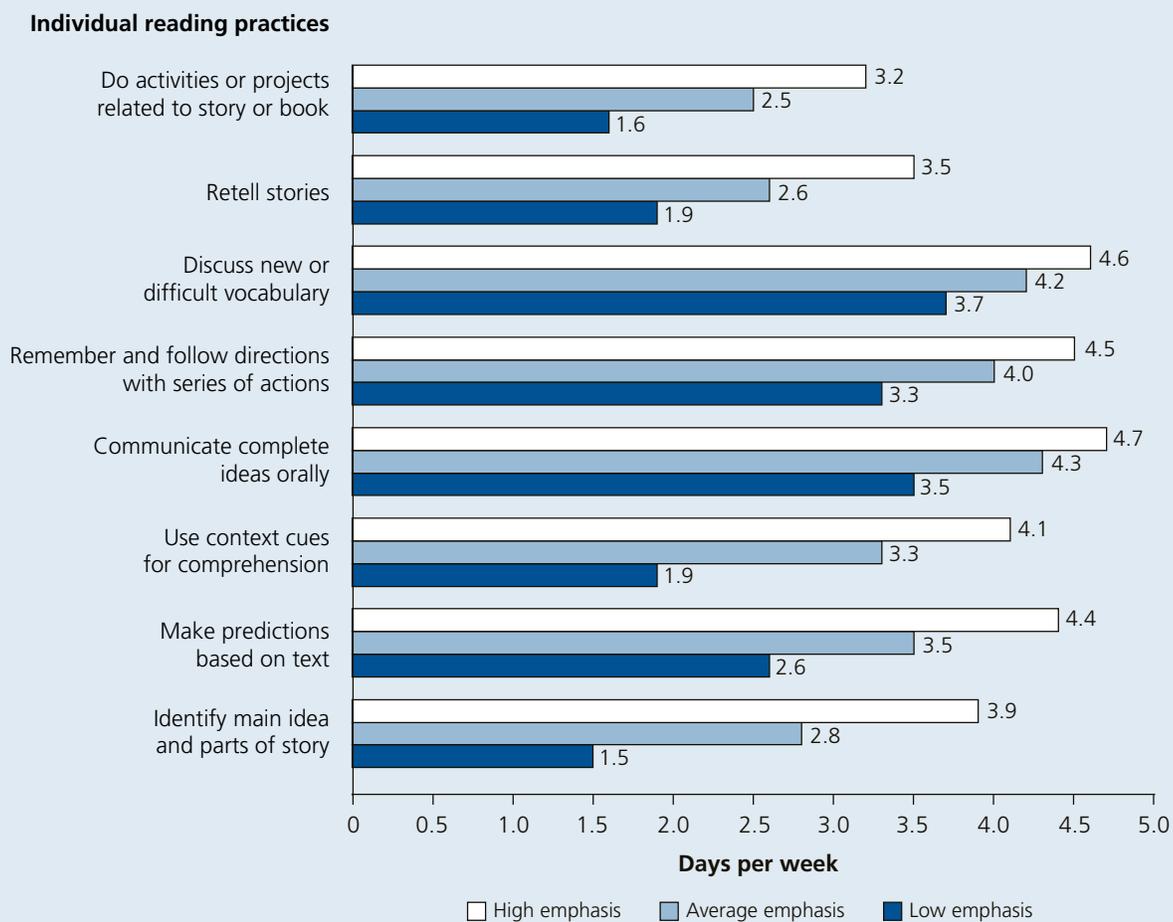
SOURCE: U.S. Department of Education, National Center for Education Statistics (NCES), Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Base Year Public-Use Data File.

Thus, this study provides evidence that children in larger full-day kindergarten classes may make slower or faster progress in reading depending on the types of instructional practices employed. Discrete literacy skills instruction may be less effective in larger classrooms where the teacher needs to ensure that a larger group of children have mastered the range of reading skills being taught. A heavy emphasis on teacher-directed, whole-class instruction may be less effective in large classrooms because the uniformity of curricular content and the instructional methods used may not match the wide range of student abilities (Slavin, 1987). Children in larger classrooms also have fewer opportunities to ask questions and

answer teacher-directed questions in whole-class discussions. On the other hand, the use of reading achievement groups in large classes may be effective in increasing reading gains because the teacher, in essence, is creating a smaller class size for instruction and providing an opportunity to present material that is more closely matched to students' capabilities (Entwisle, 1995; Karweit, 1988; Lou et al., 1996; McCoach, O'Connell, and Levitt, 2006; Slavin, 1987).

Results from this study differ from those of prior studies that have found benefits of class size for all students (Glass and Smith, 1978; Robinson, 1990), particularly studies that have found effects

Figure 3. Frequency of individual reading practices that comprise the comprehension skills scale, by amount of emphasis teachers place on comprehension skills in full-day kindergarten programs



NOTES: This figure is based on a sample of 331 public schools that offer full-day kindergarten programs. Low emphasis is defined as less than -0.5 standard deviations below average emphasis on the comprehension skills scale; high emphasis is defined as more than 0.5 standard deviations above average emphasis.
 SOURCE: U.S. Department of Education, National Center for Education Statistics (NCES), Early Childhood Longitudinal Study, Kindergarten Class of 1998–99 (ECLS-K), Base Year Public-Use Data File.

for kindergartners (Ehrenberg et al., 2001; Finn, Gerber, and Boyd-Zaharias, 2005) because it identifies interactive rather than direct effects of class size on children's reading development. By shedding new light on interactions between class size, classroom practices, and kindergarten reading gains, this study suggests kindergarten class size may be an important factor for teachers to consider when making pedagogical decisions.

Implications for Researchers and Policymakers

This study used a nationally representative dataset to detect the potential influences of full-day kindergarten classroom factors on children's reading achievement. The ECLS-K's large sample of full-day kindergarten programs and students provides greater power than do smaller studies to detect significant associations. Results from this study can be enhanced by smaller-scale research that builds on the findings of this study to explore the processes through which classroom factors influence children's early educational outcomes.

This study confirms the recommendations of early childhood researchers and educators that reading instruction is more effective when children experience a balance of discrete literacy skills and comprehension skills instructional approaches. Future research can investigate different configurations of reading instructional practices in an attempt to identify the proper balance between phonics-based and whole-language techniques. Part of this research might entail a review of the difficulty children experience with certain types of reading curriculum or instructional approaches to explore whether the teaching of complex skills and activities is more effective in small group or individualized settings than in whole-class settings.

Future research should consider the use of classroom observation of instructional resources and practices and multiple assessment measures to evaluate gains in student learning in full-day kindergarten programs. The ECLS-K teacher questionnaires include several reading instruction items that aim to capture typical reading curriculum and instructional methods. Nevertheless, the large-scale nature of data collection makes it

difficult to collect more precise information about classroom environments. Smaller studies can use observational records to identify what skills are taught in the classroom and how the teacher presents them to the class. Similarly, the ECLS-K reading assessment measures children's reading achievement using items that can be administered relatively quickly to kindergartners. Responses include pointing to the correct answer or saying a short response to each item. To capture a wider range of reading skills and knowledge, future research with smaller samples can collect measures of children's reading skills and knowledge using a variety of procedures, including oral and written response, oral reading of passages, and extended projects based on reading experiences. Many of these techniques are difficult and costly to conduct in large-scale studies, but are feasible in smaller-scale settings.

Finally, policymakers and researchers can continue to explore the complex relationships between full-day kindergarten instructional environments and children's early learning by evaluating the effects of classroom factors explored in this study along with the effects of other resources (e.g., books, puzzles, audio-visual equipment) and practices (e.g., time allocation for unstructured play, individual child exploration) present in kindergarten programs.

Conclusion

This brief provides researchers, policymakers, and educators with some of the first evidence on how full-day kindergarten programs might organize their instructional resources and practices in ways that increase children's early reading achievement. The study identifies several factors of full-day kindergarten programs that are associated with differences in children's average school gains in reading achievement over the kindergarten year. Furthermore, this study suggests that the influences of many classroom factors on child outcomes are moderated by the presence or frequency of other classroom factors. In addition to the research findings, this brief provides researchers, policymakers, and educators with guidance on how to improve future research on effective full-day kindergarten programs.

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End Notes

¹ Schools that identified their kindergarten programs as “full-day” varied in the number of hours per day (2 to 8) and days per week (2 to 5) that kindergartners attended school. For this brief, the analytic sample was restricted to full-day kindergartners who attended school daily for at least 5 hours per day.

² During preliminary work, both two-level (i.e., children within school) and three-level (i.e., children within classroom within school) HLM models were considered for this study. Although a three-level model would have been ideal, the resulting

small sample sizes would have precluded such an analysis. That is, the small number of children sampled within classrooms and classrooms within sampled schools would have resulted in over 25 percent of the eligible analytic sample children being dropped from the HLM analyses. For instance, 163 (17%) of the sampled classrooms had only a single ECLS-K sampled child, and 61 (18 percent) of the sampled schools had only data for a single classroom. Thus, a two-level HLM model was used for this analysis.

³ A one standard deviation increase in the percentage of academic instruction was calculated using the formula: (mean percentage + one standard deviation of the mean percentage) = (77.0 + 6.7) = 83.7 percent. The same calculation was used for percentage of reading instruction (i.e., 47.7 + 8.3 = 56.0 percent).

⁴ A one standard deviation increase in the frequency of discrete literacy skills was calculated using the formula: (mean frequency + one standard deviation of the mean frequency) = (1.9 + 0.7) = 2.6 days/week. The same calculation was used for the frequency of comprehension skills (i.e., 3.1 – 0.6 = 2.5 days/week). The overall increase in reading gains attributed to these changes is calculated as the sum of the HLM coefficients for the two instructional practice scales (i.e., 0.16 SD – (-0.17 SD) = 0.33 SD).